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VII

JOURNAL

OF THE ROYAL STATISTICAL SOCIETY.

JANUARY, 1917.

The Organisation of Registration in its Bearing on Vital Statistics.

The Presidential Address of Sir Bernard Mallet, K.C.B., for the Session 1916-17. Delivered to the Royal Statistical Society, November 21, 1916.

I am glad to take this opportunity, the first which has presented itself since last summer, of expressing my sense of the distinguished honour done to me, and, what is more important, to my Department, by my election to the office of President of the Royal Statistical Society; and my anxiety to justify the choice of the Society by working for its interests to the best of my ability. It will be difficult, indeed, in this respect not to fall below the standard set by the two Presidents under whom I have been privileged to serve as a Vice-President—the late Sir Charles Dilke and Lord George Hamilton, who has just relinquished the Chair after a supplementary term of office consequent upon the lamented death of Lord Welby. As regards Sir Charles Dilke, the Society has placed upon record its recognition of the high ability and energy with which he devoted himself to its service; and as regards Lord George Hamilton, I shall only express the unanimous feeling of his colleagues on the Council when I lay stress on the good fortune which enabled the Society to secure, for so unusually long a period, the services of this distinguished statesman. No one within the memory of those who hear me has filled the post of President with greater success. His devotion to the interests of the Society, his attention to its business and the work of the Council and the Committees, his charm and geniality of manner, and the ready and effective intervention in our discussions of so accomplished and graceful a speaker, will long remain in our memories, and will make the task of a successor so ill-equipped as myself, especially in the last-mentioned particular, one which will eminently call for all the indulgence of his colleagues. I confess that when the unexpected suggestion was made to me that I should succeed him I felt some hesitation about my answer. There was a difficulty, as it seemed to me, in the fact of my being an official still in active Government service. There must always be some risk of a civil servant finding himself in a false position in a semi-public post of this kind, even if it is quite unconnected with politics. As, however, my Parliamentary Chief was good enough to raise no objection either to my acceptance or to the subject which I proposed for a presidential address—that of the General Register Office statistics—and as I was aware that, owing to the war, the area of choice for a President was more limited than usual, I did not feel justified in standing aside, if it was thought that my services might be of use to the Society. It might be argued, indeed, that the occupancy of an official post, instead of being a disability, was a reason for the acceptance of this particular position. Although no previous Registrar-General has held it, no less than four Presidents have been drawn from the ranks of the active civil service, namely, Dr. Farr, Sir Robert Giffen, Sir Alfred Bateman and Major Craigie, and the connection between the Society and the public service has always been close. I need only refer to names like those of Sir Athelstane Baines (a past President), Sir Edward Brabrook, Sir Henry Rew, Sir William Clark, and Mr. Flux in our day. In my own case, at all events, the fact that I happen to be the representative of a department concerned with statistics which, from the subject matter dealt with, has always been more intimately associated with the Royal Statistical Society than others, constitutes my one valid qualification for the Presidency of your Society. This association has seldom been closer than during the last few years; my predecessor, Sir William Dunbar, was a member of your Council, and Mr. Noel Humphreys, late Chief Clerk in the Registrar-General's department, was for many years a much valued Honorary Secretary of the Society; and the present Superintendent of Statistics, Dr. Stevenson, and myself have almost continually served on the Council since we became connected with our present office.

Whether the Royal Statistical Society feels the same satisfaction in the results of its connection with officialdom is another question. I remember my friend, Sir Timothy Coghlan, some years ago expressing his disappointment that a " Society like ours, numbering among its "members so many persons of eminence in the statistical world, "should have so little influence in the official statistics of the "country." He was speaking, of course, of the evils to which the then President, Sir Charles Dilke, had drawn such forcible attention in his Presidential address of 1907, and which Mr. Bowley summarised in a subsequent paper as the "want of system in National "Statistics, the waste of energy in their collection and publication, "the want of correlation and the difficulties in the way of making "use of them." It would be futile in me to suggest that any remedy has been found, if indeed it has been sought, for the imperfections stigmatised in these addresses since their delivery. The publication of a good deal of official statistical matter has, I understand, been suspended during the war. If the critics to whom I have just referred are justified in their indictment—a question on which it would be unbecoming on me to pronounce—this is, perhaps, not wholly a matter for regret. At all events, the field will be clearer for future reform; it will no doubt be found that subjects which were formerly proper for statistical treatment have lost their importance, and that others have taken their place; and it is possible to hope that, when the period of reconstruction arrives, means may be found of establishing some form of central control and supervision without which no real improvement in these respects can be looked for. If this should come about, the Royal Statistical Society might well play its part, perhaps by appointing a Committee to go into the subject as was suggested by Mr. Bowley.

But I do not propose to enlarge on this interesting topic, which I hope will be handled by one of our Vice-Presidents, Mr. Drage, at our next meeting, and which ought to lead to a useful discussion. I think I shall better employ the time at my disposal to-day in drawing attention to the imperfections of the statistics for which my own department is responsible, and to certain changes and reforms which our experience has shown to be desirable. Although there is nothing very new in the suggestions I shall have to put before you—which have indeed long been in our minds—they are, I think, of sufficient importance to have claimed attention even in ordinary times. But these times are not ordinary; and it is inevitable that the circumstances with which we have to deal to-day should bring questions of vital statistics into a prominence which they have never before assumed. The appalling drain upon the manhood of the nation in all sorts of ways, direct and indirect, which the present war is going to cause before its close must have many consequences; and one of them will be to draw greatly increased attention to the importance of all measures tending to obviate preventable causes of death at all ages, and especially in infancy. It is unnecessary to point out that the usefulness of any such measures will be largely dependent on the fullness and accuracy of the statistical information upon which action must be based. I need probably say no more in justification of my choice of a subject for this address, but I should like to add that in what I have to say I speak only for myself, and not for any of the Government authorities by whom these questions, if they were officially raised, would have to be decided. The fact, however, that matters are only at this stage of what I may call " pious aspiration " on my part will give all the more practical value to any criticisms or suggestions which Fellows of this Society may on some subsequent occasion be disposed to contribute as a result of the present ventilation of the subject.

I do not propose to touch on the work of the Census except cursorily as a problem of reorganisation, but I desire to confine my observations mainly to the ordinary statistical work of the department, to trace its history very briefly, to review the defects in the venerable machinery of the Registration Acts, with special regard to the limitations which those defects impose upon our statistical work, and to suggest certain reforms which, if they could be adopted, would, in my opinion, materially enhance the usefulness of our work. I am not sorry to have this opportunity of emphasising the routine side of the work of my department which is dwarfed in the public eye by the publicity attaching to the work of the decennial Census.

Civil registration and the office of the Registrar-General of England and Wales were established by the Marriage and Registration Acts of 1836–37. These Acts resulted from an important and enlightened Report of a Select Committee in 1833 on the Parochial Registers and a General Registration of Births, Baptisms, Marriages, Deaths and Burials, and the Bills as originally introduced were considerably more effective than after they had run the gauntlet of Parliamentary criticism. The House of Lords amendments, for instance, among other things, removed the penal clause which would have made notification of births and deaths compulsory; permitted burial without a certificate from the Registrar or an order from the Coroner; and instituted the present unsatisfactory dual system of legal preliminaries to marriage by their refusal to agree to the provision in the Bill for the solemnisation of *all* marriages after civil preliminaries. Registration did not become compulsory until the passing of the Act of 1874.

The Registration Acts were primarily concerned with the record, the statistical side being all but ignored. Indeed, up to the present moment the only statutory provision for vital statistics is Section VI of the Act 6 and 7 William IV, cap. 86, which enacts that the Registrar-General shall send once in every year a General Abstract of the Numbers of Births, Deaths and Marriages registered in the foregoing year to be laid before Parliament. Oddly enough this particular return was selected a few months ago as the one which had become redundant and could be dropped. The development, therefore, of the statistical work of the office has been due to administrative and not to legislative action.

Modest as was the reference to statistics in the Act, it did not escape the lynx eye of Lord Ellenborough, who detected the trail of the statistical serpent, and pointed out that to the poor man it was of no benefit to have a birth registered. "It was required "to be done just to gratify the statistical fancies of some few "philosophers, in order that they might know how many persons "died and how many were born in a year!"

This accidental and subsidiary character of the statistical branch of the department has, however, turned out to be an advantage rather than the reverse. Centralisation in an office of the processes of tabulation from the materials furnished in the course of administration is a source of strength, and ensures a uniformity of treatment not attainable by the system which prevails in most other countries. The drawbacks to which I shall come presently arise mainly from the rigidity of the legislation prescribing and restricting the form of the records which supply the material for statistics.

It was a piece of singular good fortune that the preparation of the tables should, from the first, have fallen into the hands of one whose genius and enthusiasm enabled him to grasp the full possibilities of this hitherto untrodden field of research. I need not say that I allude to Dr. William Farr, who was to attain a European reputation in vital statistics, and to whom it was due that the statistics of mortality for England and Wales came to take such high rank. Even then, however, he was hampered by the limitations imposed by the nature of the materials available. The Act, for instance, provided for registration of the cause of death, but made no provision for certification of cause. The cause had therefore to be ascertained from the informant of the death, and it was not till the passing of the amending Act of 1874 that the medical certificate of cause of death came into existence as part of the legal record. To remedy as far as possible this glaring defect, the President of the Royal College of Physicians, the President of the Royal College of Surgeons and the Master of the Society of Apothecaries, addressed a circular letter to medical practitioners on May 1

1837, entreating them to hand to the informants written statements of the cause of death which could be shown to the Registrar and given as their information on this point. In view of subsequent developments it is interesting to note that these eminent medical men recommended that only the name of the disease considered to be the cause of death should be given, and not the antecedent symptoms, while the popular or common name was to be used in preference to such as is known only to medical men. In the first set of examples, issued in August, 1838, showing how deaths should be registered, the causes of death appear as "debility," "dysentery," "paralysis," "consumption," "apoplexy" and "drowning." It was hoped, at the time that the original Registration Acts were passed that a large number of medical men would become Registrars of Births and Deaths, and that by this means greater accuracy in recording causes of death would be secured. As a matter of fact, out of the 2,193 registrars appointed up to September 30, 1838, no fewer than 527, or nearly one-fourth, were members of the medical profession. From that time, however, the number of registrar-doctors has steadily diminished, until it has come within hail of vanishing point.

In the first annual report issued, one page of tables is devoted to marriages and births and about sixty to deaths, and the relative importance assigned to these three sections of vital statistics at the outset has been more or less maintained down to the present time, for in the last annual report issued (for 1914), in over 500 pages of tables, less than 50 are devoted to marriages and births. This disproportion is, of course, to some extent in the nature of things, for causes of death must necessarily be more prolific of tabular statements than statistics of birth or marriage. It was natural also that the gaze of Dr. Farr and of the medical gentlemen who succeeded him in the office of Superintendent of Statistics should have been focussed somewhat exclusively on the facts relating to disease and death; and it must be remembered that it is only in our own day that the vagaries of the birth rate have begun to attract the anxious attention of students and of the public. In the hands, however, of their distinguished successor, Dr. Stevenson, the annual reports are gradually widening in range; and the question at the last Census, which was designed to produce statistics relating to the fertility of marriage, was wholly due to his initiative. In this connection it may be of interest to refer to Dr. Farr's enumeration (in his first report) of the benefits which might be expected to flow from the practice of registration. He was evidently thinking mainly of the registration of deaths. These were—(1) The promotion of practical medicine through the study of the registered diseases by the experienced practitioner; (2) the designation of localities where disease is most rife and where there is least tendency to particular classes of sickness and infirmity; (3) the greater precision which would be given to the principles of physic by the substitution of numerical expressions for uncertain assertions, and by the presentation of an unbroken series of observations on a large scale in lieu of the limited number of facts which fall under the notice of the single observer. Finally, there would be an improvement in treatment of disease, and especially in preventive medicine, by the discovery of the existing cause, of which the register would show the agency by numerical-facts and measure the intensity of their influence.

How far these anticipations have been realised it would be impossible to measure statistically; but there is one remaining prognostication which, being expressed in figures, admits of some approach to a statistical test. "It may be affirmed," says Dr. Farr, "that it is possible to reduce the annual deaths in England "and Wales by 30,000." Seventy-five years later the annual deaths in England and Wales on a similar population had been reduced by over 120,000! It would not be rash to attribute some part of this improvement to the presentation and study of the statistics of mortality.

In the presentation of vital statistics no radical change was effected until 1911, the process being rather one of development of the tables on the lines laid down in the earlier reports, including, however, considerable alterations in the classification of diseases.

The annual report of 1911 marks so considerable an epoch in the presentation of our English vital statistics that I may perhaps be excused for drawing rather special attention to it, especially as the reforms instituted in that year, the beginning of a new decennial period, may be looked upon as a response, in one public department at all events, to the criticisms made by the eminent statistical authorities above referred to.

When Dr. Stevenson and I turned our attention to our official reports, very soon after our respective appointments to our present posts in the latter half of the year 1909, they impressed us as being defective in certain respects. Some want of co-ordination, some duplication, and the publication of a mass of figures which, except for purposes of comparability with former years, were largely devoid of practical utility, were faults which obviously called for remedy. The chief difficulty in the way of reform —a difficulty which had prevented our predecessors from dealing with this matter—arose from the fact that the areas in which our data are collected and for which they were then presented in our tables, the old Poor Law or registration areas, differed seriously from the urban and rural administrative divisions of the country brought into existence by the Public Health Act of 1875, for which vital statistics were urgently required. This requirement had been met by separate statistics furnished by the local areas to the Local Government Board (differently classified indeed as regarded causes of death), and also at my own office by the publication of an annual summary which gave partially corrected figures for the more important administrative areas in the country. Although it did not necessarily follow that the area of collection must govern the area of presentation, the cost and labour of transposing the figures had been considered prohibitive, and it had been decided to wait for the expected reform of the poor law which would, it was hoped, bring in its train a drastic reform of the registration system. It happened fortunately that the use of a system of cards mechanically sorted and counted, which we introduced for the first time at the Census of 1911, enabled us to overcome this mechanical difficulty; and owing to the cordial co-operation of the able medical officer of the Local Government Board, Dr. Newsholme, with Dr. Stevenson, two other changes of the first importance were made—the allocation of all deaths, as far as possible, to the area of residence, and the adoption of the international list of the causes of death in a form designed to preserve continuity—which brought the publications of the General Register Office (and of those for Scotland and Ireland, which adopted this change at the same time), of the Local Government Board and of the local sanitary authorities into line not only with each other, but also with those of the principal Colonies and of most foreign countries. I may add that the introduction of the card system has made it possible to increase the information afforded in the tables in a variety of ways. Once the labour of preparing the cards required for the routine tabulation as previously carried out has been accomplished, it becomes a very simple matter to obtain records of additional combinations of the facts recorded, whereas under the system previously employed each additional tabulation had to be undertaken independently, the record of one combination of facts not contributing in any way to the preparation of that of another. But as the whole question is fully dealt with in the annual report for the year 1911, I need not dwell further on this subject. I hope, indeed, that I have not wearied my hearers by what I have said, and that I do not overrate the usefulness and importance of the improvement in the presentation of our vital statistics to which I have drawn attention.

There are still some weak points, notably the difficulty in bringing our reports as closely up to date as we should like—a very important matter as regards the practical usefulness of statistics. The present war, with its military calls upon our younger men and emergency work such as that of Belgian and National Registration which have affected all branches of the department, is the main cause of the failure of our hopes in this respect. It is responsible also for the delay in the publication of our General Report on the Census in 1911, now at last on the eve of issue, which I trust will be found to bring together all the statistical facts as regards England, the United Kingdom and the British Empire, resulting from the enumerations of that year (except only the new fertility statistics, still unfortunately delayed for the reasons just referred to), in a form superior in some respects, and especially in its use of diagrams, to that of any previous general report. A more serious, because recurrent, difficulty arises from the manner in which members of the small trained statistical staff of my office is drawn upon at each decennium, for years at a time, for the work of the Census. Still on the whole I think I am justified in saying that the limits of departmental action in the way of improvement have pretty well been reached, and that greater progress is barred mainly by the obsolete legislation under which we have to act.

It is certainly the case that we are nearly at the end of what purely administrative action can do in the way of obtaining further information on which statistical research may be based. In some directions, no doubt, greater elaboration of the work on existing materials would be possible whenever staff exigencies allow; but the truth is that much of our recording machinery is out of date. In view of the increasing importance now attaching to the collection and systematic presentation of the facts of vitality and mortality, and of the demands which questions of public health and social organisation make upon the department charged with this work, it is essential, if these demands are to be adequately met and new work of any importance is to be undertaken, that the whole position should be surveyed and very considerable changes made, not only in the material to be collected in the course of the processes of registration, but in the organisation of the registration service. The two things are largely interdependent, but in what I have to say I shall, of course, confine myself as far as possible to the statistical bearings of the question.

What, then, are the main points in which, from a statistical point of view, our present registration system is defective owing to the fact that it does not allow of our obtaining the necessary information?

(1) As a record, the present entry is defective, in that it either fails to identify completely the person to whom it relates or fails to point directly to the next step in tracing the family history. Thus, in the death entry of one of the hundreds of John Smiths, there may be no clue to the marital condition or to any family relationship of the deceased man, and all we can learn from the record is that a certain John Smith, aged 54, a carpenter, died at such a place on such a day of such a disease. If, however, the entry contained statements as to the date and place of his birth, and that he was the husband of Mary Smith, formerly Jones, to whom he was married on such a date, there would be something resembling a complete identification of the dead man and indications from which the family history could be traced by any interested person. In the same way, the birth entry of John, the son of John Smith, tells us only that he was born at such a place on such a date, and that he is the son of John Smith and Mary Smith, formerly Jones, but it gives no clue to the next step backward in the family history. If, however, the entry contained the date and place of the marriage of his parents, it would direct us at once to the documentary record of that event.

(2) As regards the statistical data available, we are confined practically to the meagre details given in the record. But although, in view of the modern development of interest in public health and social and economic questions, we want, as I shall show, a good deal more in the way of information than we are now authorised to obtain by inquiries from the public, it is, of course, by no means the case that all of this is of a nature which it would be necessary or desirable to give in a record accessible to all and sundry. Thus, for statistical purposes it is desirable that in relation to births there should be data as to the order of birth and whether single or multiple, in addition to the ages of the parents and the duration of their marriage; but there is no necessity to give public record to the first items. For deaths, the additional data required beyond those mentioned under (1) include the industry with which the deceased was connected, the length of time he had pursued the occupation which he was following at the time of death, the number of children alive or dead, and, in the case of children, the occupation of the mother—none of which are required for record purposes.

(3) There is no provision for the registration of still-births. Members of the Society are well aware of the importance which has been attached to this question from the point of view of the danger to child life arising from the present arrangements and of the recommendations in its favour of such bodies as the Select Com-

mittee on Certification in 1893, and the Inter-Departmental Committee on Physical Deterioration in 1904.

It may be of interest if I now indicate briefly some of the more important items of information which we should like to procure at the time of effecting registration, and the statistical tables which this additional information would enable us to compile.

At registration of birth it would be desirable to obtain particulars as to :—

(1) Dates and places of parents' birth and marriage.

(2) Whether the mother follows any occupation other than domestic duties, and if so, whether at home or outside.

(3) Number of the children born to and surviving of the marriage.

Of these, number (1) would be embodied in the entry in the birth register, so that the family history could be traced back to these events, while the other items would not be recorded in the register but used for statistical purposes. From this additional matter it would be possible to compile tables of the year's fertility by ages of mothers, occupation of fathers, birthplace of parents, etc.; and new birth tables showing, as is already done in the Statistical Year-Book for Buda Pest, the births recorded in the year by numeral sequence of birth, with ages of parents and sexes of the children, which would afford the material for research into the question of sex ratio as affected by the ages of the parents, the numerical sequence, etc., as well as throwing light on the proportional constitution of a year's births by first born, second born, and so on. From the information as to total numbers of children born and surviving in families recording births during the year, further tables could be compiled showing :—

(1) Fertility to date of married men and women by ages, occupations, birthplace, etc.

(2) Fertility of occupied and unoccupied wives, distinguishing home and out workers.

(3) Size of total and surviving family in relation to duration of marriage, age of mother and occupation of parents, distinguishing first marriages from re-marriages.

The provision for registration of still-births would make it possible to present for the first time statistics of still-births by compiling tables showing :—

(1) Still-births by periods of gestation.

(2) Numbers and sizes of families in which a still-birth occurred during the year, with the numbers of children surviving, dead and stillborn.

(3) Still-births in relation to live births by sex, numerical sequence, ages, birthplaces of parents, and areas.

(4) The effect of the employment of wives in industry on the still-birth rate.

All these tables would break new ground of varying degrees of importance in the study of vital statistics, ground which in this country has hitherto been inaccessible through the failure of our legislation to provide for general and compulsory registration of still-births. It is true that quite recently compulsory notification has been extended to the whole country, but there is a wide difference between notification and registration; and it is to the latter that one must look for full and accurate data.

Among the items of additional information required in effecting registration of deaths are :—

(1) Date and place of birth and, if married, of marriage.

(2) Marital condition.

(3) Length of time that an occupied person has followed his occupation.

(4) Number of children born and surviving in the case of deaths of married persons.

(5) Whether, in the case of deaths of children, the mother follows any occupation other than domestic duties; if so, whether at home or outside.

Of these, numbers (1) and (2) would be embodied in the entry in the death register, so that the family history could be traced back, while the other items would be for statistical purposes.

This information would enable us to construct tables showing, as is done for most other countries :—

(1) Duration of marriages dissolved by death; and

(2) Deaths of males at ages by marital condition[1]; and further, as is already done for Australia,

(3) Deaths at ages of married males and females, and their issue.

Besides these it would be possible to compile tables (more or less new) to show :—

(1) Mortality of persons born in various parts of the country and various classes of area.

(2) Occupational mortality, purged by exclusion of deaths of persons who had changed their occupation shortly before death.

(3) Infant mortality, analysed to various occupations according as the mother does or does not follow a gainful occupation at home or outside.

(4) Mortality from certain diseases of women in relation to number of children born.

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[1] The marital condition of females has for many years been recorded in the death registers under the heading of occupation.

Of these tables, number (1) would, in conjunction with our present Census tables, permit of comparison of the mortality of London-born Londoners with immigrant Londoners, etc.; number (2) would, for the first time, give us a measure of the reliability or unreliability of rates of occupational mortality in many classes of occupation; number (3) would shed considerable light on the effect of home and factory work for married women on child mortality; and number (4) would be of value to medical science.

Further, co-related and complementary to the fertility tables derived from birth registration would be the statistical tables for marriages dissolved by death, such as those published in the Year-Book for Buda Pest :—

(1) By ages of parents at marriage: and

(2) By duration of marriage.

In addition to these, it would be possible to present tables more or less new that would show :—

(3) Size of total and surviving family in relation to :—

(*a*) Ages of parents (generally of mothers);

(*b*) Duration of marriage; and

(*c*) Occupation of parents (generally of fathers).

If the Registrar-General had power to vary and supplement the information acquired, advantage of this power could be taken from time to time in various ways, *e.g.*, by an inquiry as to the number of rooms occupied by families in which births, still-births or deaths occur, and this information could be utilised in conjunction with some of the tables enumerated. These would, of course, be most valuable in connection with the question of the relation of overcrowding to infant mortality, still-birth, etc.

In effecting registration of marriages the additional information to be recorded would include the dates and places of birth of the contracting parties.

In every case of birth, still-birth, death or marriage, the information collected as to occupation should include industry as well as occupation, so that the records of these events would become comparable with the information obtained in connection with the Census.

From the foregoing it will be seen that each record of any one of these vital events will not only be a more complete documentary identification of the individual, but that it will point directly to the previous step in the family history. Thus recorded, the entry of either a birth, marriage or death will be a starting point from which the family or individual record of the person concerned may be traced step by step so far as the registration records allow. And while the prime interest of this ability to trace the record is, of course, on the administrative and recording side of my department, it may prove of some value from the statistical side as well.

The foregoing enumeration of possible tables which could be compiled, were the additional information forthcoming, does not pretend to be exhaustive, and some of them are of much less importance than others. The field of inquiry which could be opened out is very extensive ; and all that I have done and, indeed, all that is necessary to do in addressing the members of this Society, is to indicate some lines which we desire to pursue. It would not be possible or profitable to endeavour to cover even the ground indicated in any or every year. It is, indeed, important that a department like my own should resist the tendency for statistical tables once compiled to become stereotyped. As will readily be seen, some of the tables above mentioned would be of peculiar value only in conjunction with a census, while others would be worth repeating only at intervals of five or ten years. Of their value to statistical and demographic science there can, I think, be no question.

Of the list of defects in the powers given under the present Registration Acts there are some which have no statistical interest, however important they may be from the point of view of security against fraud and crime. Such are the absence of any proper verification and certification in our law of the fact of death ; and the dangerous laxity of existing burial procedure, which, though beyond the scope of registration pure and simple, might well be remedied in a measure of registration reform. It would be outside my present purpose to lay stress on the complications and difficulties, arising mainly from obsolete machinery, with which the expert staff of the General Register Office has to contend in the daily work of administration of the registration of births and marriages. But I may perhaps mention one defect in our arrangements, which has come rather prominently before us during the war, and which is almost purely administrative, or only statistical through its administrative action. This is the question of the issue of copies of certificates of births, marriages and deaths, and their cost. Let us take birth certificates. Birth certificates are now required in connection with a whole series of Acts of Parliament, such as those affecting elementary education, factories and workshops, friendly societies and trade unions, savings banks, old age pensions, National Health Insurance. They might well be required for other purposes in which proof of age is necessary. The statutory fee for a certificate, including the search and penny stamp, is 3*s*. 7*d*.; but in special cases, as those noted, this high rate has been modified by legislation, with the result that a state of things has come about by which different rates, varying from the original 3*s*. 7*d*. to 6*d*., are now being paid for the same service, the cheap certificates being only available for the special purposes for which they are procured, so that the same individual in the course of his life may have to possess himself of several birth certificates. No legislative provision on the other hand exists for reducing the charge of 3*s*. 7*d*. in the case of certificates required for the purpose of obtaining separation allowance for dependants of soldiers and sailors. The first thing obviously required is a consolidation of these various rates, and the substitution for them of a certificate to serve all the purposes for which proof of age may be demanded, to be issued at a uniform flat rate—if, indeed, any charge should be made for the original document. The provision of such a document would not only greatly simplify administration, but would also save a considerable amount of trouble and expense to the individual. A further bearing of this suggestion will be mentioned later.

Two other points remain for mention. The inordinate time allowed by the present law for birth registration may be noticed, in the first place, on account of the duplication of work to be referred to, and the incidental effect of this and other causes on the accuracy of the registration, and therefore of the statistics, of birth. The time allowed for the registration of a birth is nominally forty-two days and actually three months. The original Registration Bill of 1836 made notification to the Registrar compulsory within three days, but treated registration as a separate proceeding to be effected subsequently. This distinction between notification and registration was preserved in the Act itself, which allowed notification within forty-two days, but threw the onus of registration not on the informant but on the registrar. And the divorce between the two has been emphasised by the Notification of Births Act, which requires notification of the occurrence of a birth within thirty-six hours to the Medical Officer of Heath, and which, while it may have proved highly beneficial from the point of view of infant life preservation, has not been an unmixed blessing to registration. Cases occur where notification is mistaken for registration, and others in which registration is delayed unduly because notification has already taken place, and the effect upon registration of births has been represented to me as serious by some authorities. Both from the point of view of the convenience of the public and of accurate record, it would be much more satisfactory that one act only should be required of the parent, and that accelerated birth registration should be combined with an immediate notification to the registrar of the fact of birth by the doctor or midwife. If the doctor or midwife in attendance at a birth were required to notify the registrar of the fact forthwith and the registration were made compulsory within ten days, there would be an efficient check on registration and ample opportunity for such steps being taken as were deemed necessary for the care of the child. Undue weight has been given in the past to the supposed desirability of securing the mother as informant of a birth, but so far as inquiry into the practice of other countries goes to show, registration is not less efficient or complete where the period allowed is so short as to preclude the mother from acting as informant. Incidentally this procedure would provide verification of the fact of birth, which is ignored under the present system. It may be pointed out that it is as easy to effect registration of a birth that has never taken place as it is to avoid registering a birth that has. The cases where this has been done that have come before the notice of my office are, it is true, rare; but those cases in which prosecutions have taken place are no index to the number that may have occurred. Again, under the existing system the same child may be registered twice or more in differing names by different persons. Instances have been known where this has happened. Most frequently it has been in cases where a baby has been adopted and the adoptive parents have registered the child as their own. Here, again, it may be safely said that the practice is probably much more widespread than would be inferred from the cases that come to light.

A great deal more serious in its statistical aspect—the point, indeed, is wholly statistical—is the fact that the certificate of the cause of death is not confidential. The National Association for the Prevention of Infant Mortality at a conference in August, 1913; the Executive Committee of the General Council of Medical Education and Registration, 1914; and, finally, the Royal Commission on Venereal Diseases (1915), have all strongly urged the adoption of confidential certification, which, so far as I have been able to ascertain, is practically universal on the continent of Europe. A few words will show the bearing of the question on our vital statistics. It is difficult, indeed, to see on what grounds the divulgation by the doctor, immediately after the death of his patient, of what may have been a secret justly regarded as inviolate during that patient's lifetime, can be justified. For that is what the communication to the relatives of the cause of death and its practical publication for the information of those interested or curious by its inclusion in a register open to inspection at the cost of one shilling amounts to. The chief objection, indeed, to the present system from a statistical point of view is that, though the present law may demand, it cannot secure, betrayal of the dead man's confidence. This difficulty arises in its most acute form in the case of deaths from venereal disease. Most of my hearers, I think, would have taken the same course as the doctor who, in reply to an inquiry from my office as to a death he had certified as due to cerebral tumour, replied that the "Disease was Gumma. "None of his family ever knew he was a syphilitic subject, and it "was most undesirable that they should—they would have done if "I had certified more definitely." In fact, though the law requires statement of the cause of death in all cases, it cannot in its present form secure it. The records of my office consequently give no idea of the mortality from venereal diseases or from alcoholism, or probably other drug habits, while the figures relating to various other causes of death are prejudiced in a minor degree. Thus, curiously enough, reluctance to certifying cancer and tuberculosis as a cause of death is sometimes met with, even apart from considerations connected with life insurance.

Insurance considerations undoubtedly exercise a very prejudicial effect upon death certification under the present open system. Numerous industrial insurance policies are taken out with a declaration by the insurer that he is not suffering from various forms of chronic disease, such as cancer, and where this has been done there may be a strong motive for concealment of the facts in a document to which the insurance company has access.

Other reasons than those quoted may, perhaps, exist for reluctance to insert a candid statement of the cause of death in the certificate under present circumstances. But I need not labour the point, since the evidence given before the Royal Commission on Venereal Diseases, including that of Dr. Stevenson, bears eloquent witness to the effect upon the accuracy of our mortality statistics of such considerations as I have mentioned, and sufficiently explains the attitude of my department on this question.

Such, then, are some of the particulars in which the records necessary for the improvement and extension of our vital statistics are either altogether wanting or defective in accuracy. To remedy these defects and give wider powers and more discretion to the administration would, of course, require legislation. But if legislation should be introduced it would be desirable, I think, that it should not be limited to these objects. I should personally like to see it extended (provided that the interests of the existing excellent registration service were properly safeguarded) so as to embrace a reform which would dissociate the local service of registration from the poor law and link it up with the public health authorities. I am aware, of course, of the practical difficulties which would have to be faced if such a measure were contemplated, but the arguments in favour of the change seem to me very strong from the statistical point of view. The same idea seems to have occurred to the Society for Medical Officers of Health, for I notice that it was advocated by them in a memorandum which came before the Royal Commission on Venereal Diseases in 1914, and that Dr. Parkes, Medical Officer of Health for Chelsea, and Dr. Chalmers, Medical Officer of Health for Glasgow, and at that time President of the Society, strongly supported the suggestion that "if there is any revision "of the administrative provisions for the registration of births, "deaths, etc., the Medical Officer of Health should be made the "official responsible for such registration." The present system dates from a time when no local administrative areas covering the whole country other than the poor law areas were in existence. Under it the local registrar is appointed by the board of guardians whose interest in registration begins and ends with the appointment. There has never been a functional connection of any importance between the poor law and the registration service. It is true that the immediate statistical difficulty has been circumvented in the manner I have described, but there is still no direct connection between the registrar of births and deaths and the medical officer of health. The intimate association of births, deaths and still-births registration with sanitary matters makes it in the highest degree desirable that in any measure of reorganisation the two services of registration and public health should be as closely related to each other as possible. The measures taken to ward off the risk of preventible death from the community are carried out by the sanitary authorities, and it seems fitting therefore that the record of the results of their labours in the shape of the registration of deaths and still-births should be in the hands of these authorities, to which, under the present system, these records have to be communicated at second hand. And early knowledge of the births taking place in their areas is of such practical importance to these authorities, that it has recently been found necessary, as above described, to duplicate the information required concerning births by instituting a system of notification to the sanitary authorities in addition to registration. In these circumstances it seems obvious that registration of births should be carried out by the authority which requires the information and has the greatest interest in obtaining it efficiently.

This is not the place to elaborate the suggestion, nor to indicate either the grouping of urban and rural areas which would be suitable and practicable, or the manner in which the central control which is essential might be secured. In many foreign countries registration is a matter of local administration, the statistical results alone being dealt with by the central or national authority, *i.e.*, the State statistical department. A change in the direction now suggested would place the organisation of the registration service largely in the hands of powerful local bodies, but should not be allowed to weaken the central control which distinguishes our system from that of most other countries. I think it is important that this control should be maintained in the fullest possible sense. It is advantageous both from the point of view of registration as an individual and national service, and from that of the statistical results which are obtained under it. It provides a central repository where all vital records may be found, and affords a guarantee that all data are collected and treated on identical lines; but it is obvious that if the suggested change could be effected and registration for the first time placed under authorities who would have a direct interest in the efficient performance of the duties, not only would the considerable labour of transposing the figures at the central office be avoided but we should secure much skilled and intelligent co-operation in the production of statistical material and immensely reinforce the practical utility of the statistical work of the central office.

I should like to pursue this question of improvement in the data for statistics, or in the method of collecting them, a little further. There is no longer any excuse for failure in the treatment or presentation of statistics, there is no lack nowadays of trained statisticians, and it would be easy to point to official publications in which statistical tabulation has been brought to a high level of excellence. But the collection of data is governed by administration; and a statistician will therefore be led on to inquire what administrative changes would be likely to assist him in his object. I have given an instance of what I mean in the suggestion that the work of the local registrars should be linked up with that of the local administrative authorities. Another may be found in the forthcoming General Report on the Census, if I may be allowed a further reference to our own work. In that report we have expressed the opinion that no very marked advance upon the result attained in 1911 is likely to be made in future, except by a radical improvement in the method of collecting the data. The schedule of questions is already more than sufficiently complicated, and it is clear that, so long as the system of reliance on the practically unchecked returns of the householder which has characterised our Census since 1841 is maintained, all the questions on the Census schedule are liable in greater or less degree to be carelessly or incorrectly answered, in spite of the efforts which are made to train the population through lessons to the children in the schools, trade union appeals, newspaper articles and the like. What is required, in our opinion, is much more effective assistance and supervision by the enumerator. But it is a question whether these could be provided except by means of such co-operation of the local administrative authorities as has been suggested in the case of births and deaths registration. If the registration service were to become the concern of the local authorities of the country, the local conduct of the Census would naturally follow, our present dependence on casual untrained labour might be diminished, and the difficulty of increasing the efficiency of the enumeration process—the cost of which under the present *ad hoc* system would be very heavy—might find a solution ; for trained and responsible local officials in considerable numbers are always in normal times at the disposal of the local authorities, and there might be some chance of appealing successfully to local patriotism for assistance.

From the point of view of vital statistics the want of a quinquennial census has never been more severely felt than at the present moment. Even in ordinary times the method of estimating the changes in the distribution of the population from the date of the last Census leaves much to be desired. The subject has been discussed in recent years by the Society, and the various methods suggested have been carefully considered ; but when all is said and done, no mathematical calculation can ever really meet the difficulty. Yet it is a matter of cardinal importance in the presentation of accurate rates for administrative areas. For the total population present methods of estimating for the later intercensal periods may, perhaps, pass muster, but for individual administrative areas they necessarily ignore the fluctuations caused by internal migration. How very materially these local fluctuations affect the vital statistics for administrative areas may be instanced by reference to the first and third quarterly returns for 1911. In the first of these the old estimates of population are in use ; in the latter the new estimate on the basis supplied by the Census. Among the great towns will be found instances of populations estimated on the old basis which are 10, 15, 20, 25 and even 30 per cent. in excess of the revised figures, while there are others in which the estimates are from 10 to 25 per cent. too low. Among the smaller towns the same divergencies prevail. The effect on local statistics can be readily imagined, for in many cases areas in close proximity are affected in precisely opposite ways. For example, while the population of Hornsey at the beginning of 1911 was over-estimated by 19 per cent., that of Finchley was under-estimated by over 30 per cent. Wolverhampton was over-estimated by 13 per cent.; Coventry under-estimated by 25 per cent.; Huddersfield under-estimated by 12 per cent.; Halifax over-estimated to the same extent. This, however, is by the way. Owing to the unprecedented dislocation of the population caused by the withdrawal of men of military ages from civil life and the demand for munitions factories and war services, the data for calculating local birth and death rates with any approach to accuracy simply do not now exist. National registration has, indeed, helped us, but without annual revision it is hardly necessary to say that national registration can supply no basis for calculations in this and future years. But the need of some kind of census or enumeration for statistical purposes at the conclusion of the war was one of the points most insisted on in two discussions on papers read before the Society last session. It is, of course, a question whether it may not be required equally for various administrative purposes; and if so, it is to be supposed that the whole matter will in due course receive attention in the proper quarters.

It is, perhaps, to national registration, improved and developed from the recent interesting experiment, that we might look for the best solution of this problem. Nothing was more remarkable in the whole operation than the enthusiastic and invaluable assistance rendered by voluntary workers all over the country unless it was the energy, ability and goodwill with which the bulk of the local administrative authorities responded to the call of the President of the Local Government Board. To repeat so great an emergency measure as this was under existing conditions might, no doubt, be an impossibility. But if some local arrangements such as I have contemplated for births and deaths registration should come into being with the consent of the local authorities, there would be the nucleus in each suitable local administrative area of an organisation which could deal with National Registration as part of its normal duty. It is conceivable that a national register annually revised might be found to replace, or to assist in the formation of, certain registers or lists, such as voting lists, military registers, aliens registers, rate books and so on, which are either now compiled specially or may be required to be so compiled in the future. How far this would be feasible would be a matter for inquiry. I merely mention it as an idea which would naturally occur to anyone trying to consolidate the multifarious calls which, in the increasing complexity of modern social conditions, are being made upon the public. Such a register, at all events—and this is the reason why I have allowed myself to be tempted into this speculation—would solve our difficulty about local birth and death rates in the most complete fashion. No longer should we be dependent on estimates, however ingeniously framed, but we should have the actual facts as to the distribution of the population annually at our disposal for our calculations, and the accuracy of the basic data for our vital statistics would be vastly increased. The bearing of such a measure on the work of the Census in future years would also be far-reaching. While on this subject of registration I may, perhaps, be allowed to refer briefly to a point which is closely connected with it. An obvious difficulty in connection with such a proposal is that of distinguishing individuals of the same name. The number of John Smiths in England is enormous, but for all the purposes of registration enumerated above it is necessary to distinguish the individual John Smiths in such a way that the one sought for any purpose can be immediately picked out from amongst the rest. It is here that the further use of the standard birth certificate, referred to above, might come in. As this document would be required on a number of occasions during the lifetime of an average man or woman, it may be presumed that it would come to be generally obtained and preserved as a matter of course. This custom, promoted by recent legislation, which demands evidence of age for so many purposes, is, indeed, already in process of formation, and would be greatly assisted by the simplification proposed in regard to the form of certificate. Assuming then the universal possession of birth certificates it is easy to see that these would necessarily also constitute identity certificates, since John Smith's certificate would identify him as that John Smith who was born on a certain date in a certain place, of named parents whose dates of birth were also recorded. I will resist the temptation to fill in the scheme by suggestions which would occur to those who, like members of my own department, have had recent experience of registration problems, for facilitating or ensuring not only the identification of the certificate with the entry in the register, but also the identification of the holder of a certificate with the person referred to in that document. If I were to venture into any further detail I should probably lay myself open to a charge of desiring to Prussianise our institutions. Registration, however, need not necessarily be accompanied by the elaborate system of police surveillance which goes along with it in many foreign countries, and I cannot help thinking that changes in this direction might be grafted on to our existing arrangements without causing undue disturbance. They might, indeed, tend rather to simplification than to additional complication; and it is sufficiently obvious that if it were found possible to set up some system of general registration and identification of individuals, certain administrative problems which have come rather prominently to the front would be easier of solution than they are at present.

Whether the demands of the future are likely to compel an effort to overcome the undoubted difficulties of this question I cannot tell, and I have alluded to it only because the statistical possibilities which would be opened up by such a measure, and which alone concern us here, are certainly most attractive. But although, as I have said, the collection of statistical data is largely governed by administrative conditions, we cannot, unfortunately, expect, however urgent our representations may be, that legislation will be framed solely with a view to obtaining the best possible statistics, and all that usually remains for statisticians is to make the best use they can for their own purposes of such opportunities as legislation throws in their way.

I will conclude this address by the customary retrospect of the events of the past year as they have affected the Society. We have to record and deplore the deaths of several of our Fellows, and, first of all, that of our late President, Lord Welby, whose place as I have mentioned was taken by Lord George Hamilton for the remainder of the session. I can add nothing to the appreciation of Lord Welby by his lifelong friend, Sir Algernon West, published in the January number of the *Journal*, except to express the indebtedness of the Society to him for his acceptance of the Presidency at his great age, and for the address which he delivered in November, 1914, on the Progress of the United Kingdom from the War of the French Revolution, a paper involving much labour and research. The death of Sir Richard Biddulph Martin, Bart., last September was another heavy blow to the Society. He had been a Fellow since 1872 and Treasurer from 1875 until his death, and he was elected to the Presidency in 1906. A paper which he read in 1873 on the question of the State purchase of railways was of exceptional interest, and led to a discussion which was adjourned for two subsequent meetings, an almost unique circumstance, I should think, in our history. His active interest in the Society and his friendly presence have been much valued by his colleagues, and a resolution framed at a special meeting of the Council will be found in the next number of the *Journal*. I may, perhaps, mention that the Council hopes to secure the services of his nephew, Mr. Robert Martin-Holland, C.B., as Treasurer in his place. Among other losses are those of Mr. Justice Beverley and Mr. A. D. Provand, who were donors to the Library on different occasions; of Mr. Samuel Whitbread, who had been a Fellow since 1859; of Mr. Richard Price-Williams, who, though he had severed his connection with the Society shortly before his death, had been a contributor of several important papers to the *Journal*, and had served frequently on the Council; of Mr. Thomas G. Ackland, an eminent actuary, who had served on the Council and the Library Committee for several years, and had audited the accounts of the Society in 1915 and 1916; of Sir Robert G. C. Mowbray, Bart., a well-known Fellow of All Souls' and for several years a Member of Parliament; and of Sir Lesley Probyn, K.C.V.O., who had served on the Council almost continuously during the past twenty years, and contributed to the *Journal* a paper on Gold and Silver, and the Money of the World, in 1895, and to whom the Society, as we have recently been informed, is indebted for a generous and welcome legacy of 100*l*. We shall also, I am sure, desire to commemorate one of our younger Fellows, Mr. F. H. Keeling, the only member of this Society, so far as I know, who has been killed in action in the present war. He was already distinguished as a student of social and economic conditions, and had, among other things, edited that very useful publication, the Blue Book Supplement of the *New Statesman*. And I must not omit to mention the death, as the result of a tragic accident, of an Honorary Fellow, M. Emile Waxweiler, who was Director of the Solvay Sociological Institute in Brussels, and who had been engaged on important work in London for the Belgian Government.

As regards the work of the Society, there is little to be said. Under the difficult conditions of the present time, described in the Report of the Council presented last June, we have succeeded in carrying on better than could have been expected, considering the heavy call which has been made upon our most active members for work in Government departments, a fact, however, upon which we may congratulate ourselves. A decrease in our numbers of twenty over the previous sessional year is not to be wondered at, and our best hope of recovering lost ground lies in a united effort to maintain at as high a level as possible the standard of our papers and discussions. Of this I trust there is every prospect in the ensuing session, as the Council have already some papers in view bearing on problems arising out of the present war which ought to prove of practical use. Among them, I hope, will be papers on the economic condition and trade prospects of certain Allied nations, beginning with one by Baron Alphonse de Heyking on Russia in January.

PROCEEDINGS ON NOVEMBER 21, 1916.

THE PRESIDENT having delivered his address,

Sir ATHELSTANE BAINES, in proposing a vote of thanks, said that Old age, according to Tennyson, hath yet his honour and his toil. In this Society the honour of the seniors included that of moving votes of thanks to eminent colleagues, and this privilege had never been more welcome to him than on this occasion. Their President for the year had been associated with them for some time before he occupied the distinguished public post he now filled. He had contributed valuable and original papers on important points connected with the Inland Revenue, and, on the Council, had frequently helped them with his advice and practical suggestions. His Address, too, would remind them that Sir Bernard Mallet had won his spurs in literature as well as in finance and statistics. They had had the pleasure of listening to a well-ordered and comprehensive treatment of a very complicated subject, in which new light was thrown upon many points, and the shortcomings of existing arrangements were frankly acknowledged, coupled with the chances of reform. What they had heard was both valuable and encouraging to those working upon the material with which the Registrar-General so liberally provided them, and he could confidently voice their gratitude. They all recognized that whilst congratulating themselves upon having Sir Bernard Mallet at their head, they should take the opportunity of also congratulating the General Register Office on enjoying the same good fortune. His Presidency had the further advantage of continuing in a closer form the connection referred to in the Address between the Society and the Registrar-General's Office, a link which had been maintained, in some form or other, almost since the Office was founded. The Society had often found occasion, as the President had remarked, to criticize the chaotic conditions and want of organization in our official statistics and the need of co-ordination and reform. Nevertheless, it is not forgotten that the Society, from its beginning, has been in close and friendly touch with the great statistical Departments. First came the Board of Trade, then, as above mentioned, the Registration department, and, when the Board of Agriculture entered upon its statistical career, some thirty years ago, the Society drew from it, as from its predecessors, some of its most distinguished members and representatives. Through this connection, its views and objects have been more influentially brought before the Government than would be possible for a Body attached to the State, as in some countries, or deliberately aloof, as in others. He would not draw odious comparisons, and say which of the above departments seemed to be of the most importance at the present time to the country, statistically. Graver problems are before all three than they have ever been called upon to solve hitherto. But in the first rank stands the question of the maintenance and recuperation of the man-power of the Nation, a question which can only be appreciated through the vital statistics, as may be judged from the prominence given to-day to the preservation of infant life and maternal health. A great deal was being said and written about this just now, and, if he might be allowed to say so, he was always pleased to note how a gush of what the Americans call "hot air" on the subject could be reduced to a moderate temperature by the statistical cooling draught Dr. Stevenson knows so well how to administer. Vital statistics, above others, perhaps, are liable to yield grievously wrong conclusions except in the hands of those who know them, as it were, from their very roots, and can turn the figures into statistics by scientific handling. It was not within his province to dwell upon the many improvements in vital statistics shown by the President to be necessary. Some of the more general amongst them had been already before the Society, and its views had been placed before the Government, occasionally, as in the case of the Census, with some success. In regard to the others, he could say that they would be generally endorsed here, where most of the members could sympathize with the President as to the difficulties in getting them carried into effect. He would only remark, in reference to the administrative side of the Registrar-General's work, that he fervently hoped that the tendency of any change might be toward centralization of control over the collection of the material, and not only to its compilation and analysis. He did not think the object would be difficult to attain with the organization of Local Government areas now existing. He was aware, however, of the uphill nature of the task of getting through legislation which involved touching the domestic life of every household in the country, as do some of the necessary proposals in question. And even after the front political line has been carried, there are always a series of Departmental dug-outs, from which a full supply of machine-guns are manipulated with fatal accuracy. He hoped, all the same, that Sir Bernard Mallet would be in the end successful. He possessed, as it were, an hereditary aptitude for administration, and was taking up his task at an age which justified him in expecting to be able to see it through before he withdrew into the shade of a pensioned afternoon. Even then, too, the experience of the Society proves that the taste for statistics is not extinguished by retirement from official life, and, to quote Horace :—

> "Quo semel est imbuta recens servabit odorem
> "Testa diu."

We are all apt to find that the functionaries who sit in our places, though doing very well, are all the better for a bit of stimulus from those who went through it all before them. It may be thus with the President, but this is to look forward an unnecessarily long way, it is to be hoped. He had much pleasure in moving the vote of which he was in charge.

Dr. Newsholme, in seconding the vote of thanks, said that Sir Athelstane Baines had moved it from a very wide experience, not specially connected with the Departments in which their President worked; but he seconded it from the standpoint of one who was intimately connected with Sir Bernard Mallet's work in the Registrar-General's Office and of one the success of whose official work at the Local Government Board was intimately bound up with that of Sir Bernard Mallet's Department. The Address of the President had been divided into two parts. In the first part he had mentioned the present disabilities and, in the second part he had adumbrated certain reforms, all of which he thought they would agree were important and ought, ere long, to be realized. He was quite aware, as the proposer of the resolution had said, that reforms were frequently retarded; but all things came to those who waited. and he sincerely trusted that during the official lifetime of their President those reforms would be realized. The President's Address had mentioned the fact that in 1911 a change took place in their national vital statistics. In his opinion that change was epoch making, and was only second in importance to the changes brought about by the actual establishment of their vital statistics in 1837. When a future President came to address them on the history of the vital statistics of this country, he was quite clear that the Annual Report of the Registrar-General for 1911 would be declared by him to stand out as marking the beginning of a new era. In that Report, for the first time, the statistics were presented not only for registration areas as in the past, but for every one of the 1,800 odd sanitary areas of the country, thus enabling everyone who was interested in public health progress to keep his finger on the pulse of each of those sanitary areas in the light of accurate statistics. This, previously, had never been possible. It was quite true that the Local Government Board had required from Medical Officers the statistics of each of those areas; but those very frequently had been and still were compiled by general practitioners who also were Medical Officers of Health, and that fact alone indicated to them that often the statistics could not be trusted. In addition, in the year 1911 the Registrar-General, very wisely, altered the classification of causes of death so as to make it possible for the statistics of this country to be comparable with those of nearly every other civilized country. Those two reforms were of very great importance. A third reform he might mention which had not been referred to by the President, was that in Dr. Stevenson's Annual Reports year by year appeared for selected diseases secondary causes of death. As they knew. every single death statistically must be referred ultimately to one cause. That, however, did not tell them the whole truth; and the excellent card system which has been introduced in the General Register Office enabled Dr. Stevenson and his colleagues to let them know, not only the primary cause of death. but its secondary causes. In that way there were accumulating in the General Register Office important statistics relating to the chief diseases of this country, so that they could know, not only the primary, but the subsidiary causes of death for each of those diseases.

The President had told them that the limit of reform had practically been reached under the present obsolete conditions of machinery and that the present need was new machinery. In the first place, improved birth registration statistics were needed. That aspiration would find an echo in every statistical mind, and the possibilities of development in that direction were of very great importance. At a time when their birth-rate was rapidly declining, it was important, not only that the important new fertility statistics the publicity of which was delayed owing to the war should be forthcoming as early as possible, but that further study of our birth-rate statistics should be developed, as it was of extreme importance that they should know exactly how they stood on that matter. These statistics had a bearing on the question of child mortality, and it was important that there should be means available for correlating accurately our statistics of fertility and of child mortality. Referring to the confidential certification of deaths mentioned in the Address, that, again, was a reform which was urgently called for. Dr. Stevenson's evidence before the Royal Commission on Venereal Diseases had brought out the extreme importance of that. There were many causes of death which were not accurately and never will be accurately stated so long as the death certificate comes into the possession of the relatives of the deceased. It was, of course, true that confidential certification would not absolutely ensure completely accurate certification of deaths, for some portion of the inaccuracy was the result of imperfect certification by doctors, which might continue to some extent, but to a less extent, undoubtedly, if the certification were made confidential. With regard to the dual notification and registration of births, the present arrangements undoubtedly were inconvenient, and he trusted that ere long, while the early notification of births remained it would be practicable to arrange for the registration to be effected much earlier. He agreed entirely with the opinion of the President as to the extreme importance of continued centralization of their national statistics. It was only in that way that uniform and accurately corrected statistics could be secured. The President had not informed them so fully as he (the speaker) could do of the extreme value of the assistance which the General Register Office were lending, not only to the Local Government Board, but also to Medical Officers of Health throughout the country. An additional boon which they had granted to Medical Officers of Health within the last two or three months was that it had been arranged with the Local Government Board that every Medical Officer of Health throughout the country should be supplied in the March following the termination of the year to which the statistics related with a statement of the number of deaths in his own area, arranged under twenty-nine causes of death, and in that way he would have, not statistics collected by an amateur, but trustworthy statistics collected in a central office. By no other method than by centralization of their statistics could such a boon be arranged, so that for every area exact statistics would be available as to the main diseases causing death in that area. In the last part of his important address the President had alluded to what must attract every thinking person interested in vital statistics, namely, the idea of a personal *dossier* relating to each individual and carried on for that individual through life. That was an idea which had attracted many of them, but they had never seen their way to its practical realization. But in actual fact at the present time many stages towards its realization had been reached. To a great extent in connection with maternity and child welfare centres, which were being started all over the country, records were being kept of a large proportion of the infants of this country. After the birth was notified, the child and the mother were visited and there was a record of those visits. Very shortly those records would continue up to the age of five, when the child came under the supervision of the School Doctors attached to the School Medical Service. That went on to the age of 14. At present there was a gap of two years between 14 and 16. At the age of 16 one-third of the total population came under the National Insurance Act, and there were records for insured persons in process of development. They were largely on the way to the development of records which would be of national importance and of equal importance in the interests of every individual concerned, and which could be kept without any divulgence of the confidential character of the records obtained. He sincerely trusted that the aspirations for a system of national registration which would simplify and unify and extend the forms of registration for many purposes already existing would become realized. He was sure that they were all very greatly indebted to Sir Bernard Mallet for his valuable and important Presidential Address, and he had the greatest pleasure in seconding the vote of thanks.

Lord George Hamilton said he would like to associate himself with the vote of thanks before it was put to the meeting. He thought there was a good deal due to the pressure he personally had put on Sir Bernard Mallet, who had reluctantly undertaken the post of President of the Society. He said reluctantly, because he had heavy official work and had doubts as to whether or not he would be able to give the necessary time. They might all congratulate themselves on having secured such a President. He noticed with great pleasure that the main feature of his Address was practically a denunciation of the antiquated machinery with which he had to work his office. That was a very great admission, and he shared in the aspirations to which Dr. Newsholme had given such eloquent expression. He hoped that they would soon see a complete system of national registration for many purposes, not only established, but acquiesced in by the great mass of the population of the Kingdom. As they knew, the difficulty in the past had been that a large proportion of Englishmen and, still more, Englishwomen, had looked upon registration as a sort of personal insult and as an inquisition which was inflicted upon them in the way of penalizing or stigmatising them. He thought that a wider patriotic spirit was now being shown under the stress which they were passing through, because there was no reluctance to the legislation which was recently necessary. He believed that there was a most hearty co-operation all round. They were therefore very pleased to have Sir Bernard Mallet as their President, and they sincerely hoped that in his tenure of office, before he returned to the ordinary rank of a Fellow, his work would have been able to have carried out some of the reforms that he had indicated in his Address.

A vote of thanks was put to the Meeting and carried unanimously.

Sir BERNARD MALLET, in reply, said that he wished to express his grateful acknowledgments to the mover and seconder of the vote of thanks, and to Lord George Hamilton, for the kind things they had said about his Address. He had indeed felt almost uncomfortable under some of his friend, Sir Athelstane Baines's, complimentary remarks about his qualifications for the Presidency. At the same time he valued very highly such an expression of goodwill from his colleagues. He was particularly glad to hear the comments and to have the support of an expert like Dr. Newsholme, who had probably a good deal more power than he had to bring about some of the reforms which both of them desired. He had observed in the newspapers that learned societies were criticized, in these times of national anxiety, for their persistence in dealing with questions which might be considered of an abstract or technical kind. He thought that that sort of criticism could be pushed a good deal too far; and it certainly would be impossible for their own Society to invest their Papers and discussions with the character of popularity. Still, he thought it was important that they should show themselves willing to bring any special knowledge they might possess to bear on the practical problems which were crowding on administrators. From that point of view he was very glad to have had an opportunity of putting some of his own special difficulties before the Society, and he only regretted that the immemorial custom forbade the discussion of a Presidential Address, which would have been peculiarly helpful in the present case.

The following Candidates were elected Fellows of the Society:—

Hon. Robert Henry Brand, C.M.G.
Ralph Cope.
Charles Ronald Vawdrey Coutts, F.I.A.
Martin Coles Harman.
Ganesh Bhaskar Jathar.
John MacKay.
Frederick James Marquis.
John Bruce Polwarth.
Rev. John C. Pringle, M.A.
Robert Richards.

THE REORGANISATION OF OFFICIAL STATISTICS AND A CENTRAL STATISTICAL OFFICE.

By GEOFFREY DRAGE, M.A.

[Read before the Royal Statistical Society, December 19, 1916, the President, Sir BERNARD MALLET, K.C.B., in the Chair.]

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ONE can hardly take up a newspaper in which there is not a reference to the economic reconstruction which, it is said, must take place after the war, and we have been told by the late Prime Minister (Mr. Asquith) that there is a "Peace Book" on the stocks which will no doubt be as useful as the "War Book," prepared by the Imperial Defence Committee, with its instructions to public authorities as to what was to be done on the outbreak of war. There are daily speeches in the papers on imperial problems after the war, and both throughout the Empire and in the allied countries attempts are daily being made by experts to translate the resolutions passed by the Allies at the Paris Conference into practical measures to be adopted and enforced, both during the war and when the end is reached.

Any economic reconstruction that may be thought desirable now or later on must be founded, either expressly or by implication, on official statistics, and there is perhaps no public sphere in which there is so much room for reform as that of the statistics published by the Departments of State. A few striking examples will illustrate our deficiencies from the point of view of the man in the street. Early this last autumn, the First Lord of the Admiralty (Mr. Balfour) spoke at some length of the vital necessity of maintaining the British Mercantile Marine, and the public would no doubt imagine that so elementary a fact as the number of trained British seamen, the backbone of that service, who were at the disposal of our shipowners before the war, could be easily ascertained by reference to official publications. But if the Blue Books are consulted, it will appear that particulars are forthcoming with regard to two classes, British seamen and British sailors. Investigation shows that under British "seamen" are included firemen, engineers, cooks, stewards, and even stewardesses and cattlemen. Under British "sailors" fall able seamen, seamen undefined, and ordinary seamen, but it does not appear whether these men have had any technical training at all; indeed, it is certain that a great many of them have not. Under these circumstances, it was not to be wondered at that the figures were not understood by a President of the Board of Trade (Mr. Buxton) who was led to state, in 1912, that the numbers of British seamen had increased, when, as a matter of fact, they had decreased. It should be added that the figures in the Blue Books issued on this subject by the two departments concerned are apparently calculated on a different basis.[1]

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[1] *Times*, May 3 and May 16, 1912. Cd. 5745. Cd. 3841. Cd. 1491 Cd. 6180. Cd. 6442. *Morning Post*, December 8, 1916.

Before the war, a controversy had raged for more than a decade on the subject of the trade of the United Kingdom and the Empire, in which the terms "dumping," "volume of trade," "exports "and imports of manufactured goods," were freely used. The inquirer found to his astonishment that there was practically no official statistical information as to dumping which, indeed, in the opinion of the late Sir Robert Giffen, should have formed the subject of a special enquiry. He discovered in the classification of imports, (*a*) from Russia, among manufactured or partly manufactured articles, hemp dressed or undressed, also oil and seed-cake, (*b*) from the United States, copper, leather and petroleum. Moreover, if he looked at exports from the United Kingdom, it appeared that, owing to a difference in the methods of calculation, the exports to New Zealand differed by 11 per cent., according as they were recorded in the Blue Books of the United Kingdom and the Dominions. Further, it proved that while the controversy concerned the whole trade of the United Kingdom, the information available referred to the external trade, whereas, with the exception of the coal trade and British grown grain, there was no information as to the internal trade which was known to employ about four-fifths of the labour of the country. Besides which, there was no information as to the interchange of trade between Great Britain and Ireland, though such information would have had an important bearing on the Home Rule controversy which had been raging for more than thirty years.

If the difficulty was great within the Empire, it was even greater when any comparison was made with foreign countries, such as would be necessary if the decisions of the Paris Conference are to be carried out. There were, indeed, Blue Books published as to the cost of living in the United Kingdom, France, and Germany.[2] But in regard to prices, those relating to the United Kingdom were collected in 1903–4, those of Germany during 1906–7, and those of France during 1907–8, and no allowance was made for the change of prices during the different periods. In regard to wages, the agricultural labourer was not considered. Certain trades were selected for comparison, but no indication was given of the proportion which the men in the selected trades bore to the whole population. The wages quoted for France and Germany were based on returns of earnings in an ordinary week, those of England and Wales were standard time rates. The relations of earnings to standard rates were not given, and there were no indications that similar designations of workmen indicated similar work done.[3]

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[2] Cd. 4032. Cd. 4512.

A similar picture was revealed to the social reformer. It was impossible to form any idea of the total expenditure, central and local, on National Health Insurance, and, as far as I am aware, there is not even a detailed report of the Central Office in London giving the details of the sums expended on so vital a matter as the institution and maintenance of the register.[4]

To come down to the present time, a deputation waited on the President of the Local Government Board (Mr. Long) on September 21, 1916, to press upon him the need of housing reform, which has been described as the most urgent of and the key to all social reforms. In his reply, the President stated that he had indeed a comprehensive and practical scheme which he had submitted to and intended later to press upon his colleagues, and he was not sure "that 20,000,000*l.* was even an index of what might be "required." No one would grudge, indeed every one would support, any reasoned or reasonable expenditure for such an object, but those who have been actively engaged in promoting housing reform for the last twenty-five years will recollect that, as far as rural housing is concerned, a simple, cheap, and effective remedy was proposed in the nineties by two thoroughly representative Royal Commissions, those on Labour, and Agriculture. The Royal Commission on Labour, in the Fifth and Final Report,[5] after reciting the ample powers already possessed by the local authorities under existing laws, recommended that the owners of all houses, let at a rental of less than 10*l.* a year, should be obliged to make an annual return to the sanitary authority stating the number of persons in each cottage, their sex and age, whether the house is provided with a proper water supply, and a closet, and whether the premises are in good repair. Such a return, giving statistics of defective cottages, would have concentrated public opinion, the real power in the State, on the recalcitrant owners and authorities and would have long ago compelled reform. Such a return is even now a basis without which any expenditure, in the shape of loans to local authorities or landowners or otherwise, will probably be futile. It has been urged on the Government again and again, but so far in vain.

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[3] *Journal of the Royal Statistical Society*, January, 1910.

[4] How vitally important it is that the working of the Insurance Acts and Old Age Pension Acts should be statistically examined is shown by expert evidence, given at the House of Commons before the Committee appointed by the Faculty of Insurance, on November 9, 1916. "The original intention "was that the two (Acts) should work together." The result is that the present system is unjust, and does not protect the thrifty man.—*Westminster Gazette*, November 9, 1916. *Cp. infra* p. 42

[5] C. 7421.

If we turn from the needs of the present to the history of our statistical institutions, we find that the want of a proper system has long been recognized, and that members of this Society have long been pressing for a remedy, namely, a Central Direction. In 1871, Mr. Purdy, who was then Secretary to the Poor Law Board as well as one of the Secretaries of the Society, read a paper, before this Society, on the "Preparation and Printing of Parliamentary "Statistics," in which he pointed out that returns moved by members of Parliament were often defective because they neither knew exactly what they wanted nor what the department could supply, that the departments and officers concerned, in some cases, neglected, in other cases, positively refused to supply information required of them and that departmental statistics were compiled and presented to Parliament in departmental Blue Books more for the advantage and information of the departments than for the benefit of the public, and he advocated the institution of a Central Statistical Office with the following duties[6] :—

1. It should make itself master, as soon and as fully as possible, of all clues to statistical and tabular matter printed through the sessional papers.

2. To accomplish this, the department should index all statistical returns and principal papers upon some comprehensive and intelligent system, working backwards into past sessions and concurrently with the present. It could then be readily ascertained what information upon given subjects, if any, had been published.

3. The department should be possessed, as far as needful, of copies of all forms, accounts, and books, used in the ordinary business of the different Government offices. This would be some guide to the capabilities of the respective offices for making returns.

4. Wherever such documents failed in determining the official means, the intermediary would have to communicate personally with the department responsible for the return.

5. It should be the duty of the intermediary department to draw up, whenever required, notices of motions for returns, and in all cases to ascertain if returns on the "Order Book" are really practicable in the shape asked for.

6. The department should keep a registry of all returns in

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[6] *Journal of the Royal Statistical Society*, Vol. XXXIV, p. 39. The refusal to supply information seems extraordinary, but is recorded again in 1907, Vol. LXX, part IV, in the case of judicial statistics.

progress that none be lost sight of, or be allowed to linger on the road to Parliament. This is a frequent cause of complaint.

7. Before returns are laid upon the table, the department should be required to examine them with a view to ascertaining whether the requirements of the mover have been properly answered.

When returns are ordered to be printed, they should be supervised by the department with care. Ultimately, completeness of information and uniformity would be obtained before going to Press.

" I have assumed," adds Mr. Purdy, " throughout that when " Parliament orders a return it seeks under the given form for " the best possible information. That object under existing " procedure is too often frustrated."

Mr. Purdy emphatically disclaimed any intention of wounding official susceptibilities or disclosing the shortcomings of employés and departments, a disclaimer which can be heartily reiterated at the present time. Obviously, however, the rivalries of the different departments, each of which, then as now, ran its own system of statistics, was one of the evils which he had in mind, and it was an open dispute between the Board of Trade and the Board of Customs which led, in 1877, to the appointment of a Treasury Committee on Official Statistics. The Treasury minute, signed by Mr. W. H. Smith, appointing the Committee, stated in words which, like those of Mr. Purdy, are true to-day, " It can scarcely " be said that, at present, there is any system at all. Each " department compiles and publishes, from time to time, information " more or less detailed, with regard to the business with which " it is concerned, but there appear to be no fixed principles laid " down for the guidance of the several offices, and the consequence " is that but little harmony or coherence exists between the various " classes of statistics thus published. Comparison between them " is often impossible, and their practical utility is thereby most " seriously impaired. Perhaps, no better proof of this is required " than the fact, in connection with bills and motions in the House " of Commons, that returns are constantly being moved for to " supply information which is already before Parliament in official " Blue Books, but which is there so embedded in masses of detail " that it is no wonder that members shrink from the labour of " extracting it for themselves." Mr. Childers, afterwards Chancellor of the Exchequer, was Chairman of the Committee, and among the members were Mr. Arthur Balfour, Mr. (afterwards Lord) Farrer, and later Mr. (afterwards Lord) Ritchie, and Mr. (afterwards Lord) Welby.

The Committee reported, in 1878, on the departmental quarrel, and later in the same year on the varying financial years in the United Kingdom for annual returns on local taxation, and at the end of 1879 on the main subject of their reference. In this last report which was published in 1881, and which is still well worth reading from beginning to end, they stated that the unsatisfactory condition of official statistics was due—(1) to the attempt to make the Blue Books presented to Parliament serve the double purpose of continuous public record and of temporary instruction to administrators and departmental officers; (2) to the absence of any central or general supervision of national statistics regarded as a whole. The principal recommendations of the majority of the Committee were—(1) that the statistics of each department should be divided into two classes, those that are required by the department for administration and those which are of continuous interest to a considerable section of the public or Parliament; only the latter should be presented to Parliament; (2) that a small Central Statistical Department should be appointed, at first for one year subordinate to the Treasury, and later under a small permanent Board, which should be charged with the preparation of the Annual Abstracts, home, foreign, and colonial, and with the editing of a miscellaneous volume containing returns from smaller offices as cannot be contained in any of the volumes of the larger departments, and with the compilation of an Annual Index to the returns presented to Parliament.

Among the suggestions calculated to prevent further departmental controversy, which were made by the majority, was a proposal to remove from the Board of Trade to the new department all statistical duties not directly concerned with its administration, but a minority, which consisted of two representatives of the Board of Trade, preferred to leave matters as they stood in this respect.

More than a quarter of a century later, Sir Charles Dilke arrived at the same conclusion of the necessity of a permanent statistical direction[7]; a mere meeting of statisticians from the various departments to constitute an advisory Committee was not, in his opinion, sufficient. He pointed out, in 1907, in his Presidential Address to this Society, which Professor Bowley has described as "a terrible indictment" of the existing system, that, in spite of some good work done by individual departments, there had been little general improvement since 1880. Other departments had arisen, such as the Board of Agriculture and the Board of Education, which furnish "more or less independently a considerable "mass of Parliamentary statistics." Moreover, statistical offices have been created in connection with other departments, "totally "independent of each other and possessing but imperfect knowledge "of the work upon which other offices have been and are "engaged." Departmental Blüe Books still include quantities of matter, not because it is interesting or useful but in order that, as Sir Charles Dilke observes, they may show how much work has been done in the year. It is still true that with but few exceptions the statistics of each department are treated as having only an individual departmental significance, moreover the figures given by different departments clash, and are often found to be perfectly useless on occasions of general enquiry.[8] Our system of collating motions for Parliamentary returns between England, Scotland, and Ireland, and of indexing these returns when made, is as weak as are our statistical methods, and it requires, to use Sir Charles Dilke's phrase, "the industry and experience of a Giffen to detect "even one-tenth of those defects." Partly, individual members of Parliament, in their ignorance of the administrative system of the United Kingdom, move for returns without considering what is the exact extent of the information they require, or whether it is already accessible to them, and without knowing how to express a limit to their desire. Partly, Parliament as a whole is to blame for making the years to end for different purposes at different dates. Partly, departments are to blame for not impressing on Ministers the need of uniformity and the necessity of amending legislation in that direction.

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[7] *Journal of the Royal Statistical Society*, Vol. LXX, Part IV. With this may be compared Vol. LXXII, evidence given by Sir Henry Rew before the House of Commons Select Committee on Publications and Debates Reports, 1909. Sir Henry Rew lays stress on the fact that, whereas there had been much destructive criticism, the constructive criticism had been rare. The Select Committee, after hearing the evidence, came to the conclusion that the subject was not within the terms of their reference. But the Committee did express its surprise that this question had not received greater attention since the Enquiry by the Committee, appointed in 1877, into the whole subject, and a subsequent enquiry by a Departmental Committee, in 1890, into certain

The more one knows of the existing confusion, the less one wonders at the distrust of all statistics which pervades the public.

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questions connected with the taking of the Census. The question of the Census has been dealt with by the President in his Address and is only incidentally referred to here.

It may be added that statistical sections have recently been added both to the War Office and to the Munitions Department.

[8] *Journal of the Royal Statistical Society*, Vol. LXX, Part IV, gives detailed instances.

Take the facts which must come to the knowledge of any business man. Revenue returns relate to years ending on March 31, while trade, shipping, railway, Post Office, and other statistics relate to years ending December 31. Returns for savings banks through the Post Office are for the latter year, returns for trustee savings-banks are for years ended November 20. While revenue expenses are for the financial year, the income tax is not exactly the same. All figures for receipt of tax are for the financial year, but all figures relating to income assessed are for an income tax year ending April 5. So too for inhabited house duty, with the exception of Scotland, where the house duty year ends on May 24. The poor rate years of the three kingdoms are all, I believe, still different from each other as when Purdy wrote.

These instances might be almost indefinitely multiplied. It is difficult to convey the feelings of bewilderment and almost despair of, not only the business man, but still more of volunteer public servants, such as county councillors, guardians, justices of the peace, who have constantly to deal with official figures. This feeling is deepened when one finds authorities of great experience and knowledge, like Sir Charles Dilke, stating: "It may be as "confidently asserted now, as it was by William Newmarch in "1869, that any Chancellor of the Exchequer desiring to reform "our whole system of taxation would find himself without the "necessary statistical equipment for his task."

Another distinguished authority, Professor Bowley, who is also in favour of a Central Thinking Office of Statistics and agrees with Mr. Mandello that statisticians should think more and publish less, states: "Whenever a scientific enquirer endeavours to describe "accurately some social or industrial development or wishes to "bring to the test of statistics the effect of some proposed reform, "whether in taxation . . . care of young children or whatever "it may be, some essential information is found lacking for the "reason that it has been no one's business to collect it."[9]

Before leaving the United Kingdom, we may summarise the chief causes of the unsatisfactory condition of official statistics, putting on one side those which are due to the ignorance and laches of Parliament, as:—(1) Lack of co-operation between the different departments. (2) The absence of any central or general supervision of national statistics as a whole. (3) The attempt to make the Blue Books, annually presented to Parliament, serve the double purpose of continuous public record and of temporary instruction to administrative and departmental officers. (4) The inclusion in departmental reports of quantities of matter for the purpose of showing how much work has been done in the year. (5) The fact that compulsory powers are too few and too seldom applied. (6) Defective supervision in the collection of statistics and the employment, especially for Census work, of ill-paid, uneducated, and therefore uninterested persons in the collection. The remedy for these failings is generally admitted to be the institution of a general direction by a Central Department which should issue a general Statistical Year Book. The only thing like a year book at present in existence for the United Kingdom is the Board of Trade's Statistical Abstract which compares very ill with the Statistical Year Book of any foreign country or sister state. Sir Charles Dilke pointed out in 1907 that not only do these figures overlap in some respects, but also they do not coincide with the statistics of the Home Office as regards, for example, coal production, or with the inland revenue as regards consumption of spirits. Moreover, there are subjects of first-class importance, such as public health, which find no place in the volume. Further, it is obviously put together with the sole view of being useful to the officials concerned. There is no preface or introduction explaining the origin, scope, and limitation of the statistics; they are not even grouped on a scientific method or in a manner intelligible to ordinary persons. There are no maps, diagrams, or letter-press, though here and there a few footnotes are inserted. A glance at the volume of the London Statistics, 1913–14, published by the London County Council, will give an idea of what might be done to explain a complex system, if it is not considered fair to compare the Abstract with the statistics of a new country like the Australian Commonwealth which has a simpler task, or with foreign countries whose statistics have a longer history and are therefore based on greater experience.

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[9] *Journal of the Royal Statistical Society*, Vol. LXX, Part IV, and Vol. LXXI, Part III.

The Departmental Statistics are, it is true, now compiled by many authorities, as is shown by the following memorandum handed in by the permanent secretary of the Board of Trade to the Dominions Royal Commission[10]:—

"The Board of Trade publish statistics relating to the trade, "industry, &c., of the United Kingdom, viz., statistics relating to "foreign trade (published jointly with the Department of Customs "and Excise); navigation and shipping; emigration and immigra"tion; railway capital and traffic; railway accidents; wrecks and "casualties to shipping; census of seamen employed; tramways; "insurance companies; bankruptcy; labour exchanges and

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[10] Cd. 7351.

"unemployment insurance; wages and hours of labour; trade "unions; strikes and lockouts; the Census of Production; and other "commercial and industrial subjects. In addition to this information "regarding the United Kingdom, the Board of Trade also publish "statistics relating to the trade, population, &c., of the other parts "of the British Empire and foreign countries.

"Statistics relating to the United Kingdom are also compiled "by the following departments (among others) of the character "indicated:

Principal Departments other than the Board of Trade preparing statistics.	Principal subjects upon which statistical information is published by the respective Departments.
Board of Customs and Excise....	Imports and exports (in consultation with the Board of Trade); customs and excise, revenue and administration.
Board of Agriculture and Fisheries for England and Wales, and Board of Agriculture for Scotland.	Agriculture in England and Wales and Scotland; agricultural holdings; area under and produce of crops; live stock; sea and inland fisheries of England and Wales; corn sales and prices, &c.
Board of Agriculture and Technical Instruction for Ireland.	Agriculture; agricultural holdings; area under and produce of crops; live stock; the trade of Ireland, &c.
Fishery Boards for Scotland and Ireland.	Sea and inland fisheries of Scotland and Ireland.
Lunacy Commissioners for England and Wales, Scotland and Ireland.	Lunacy, lunatics, asylums, &c.
National Debt Office	National debt.
Registry of Friendly Societies	Industrial, provident, and co-operative societies and building societies.
War Office	Regular Army and Army Reserve, and the Territorial Forces.
Admiralty	Health of the Navy.
General Register Offices, England and Wales, Scotland and Ireland.	Census of the respective divisions of the United Kingdom. Population, births, deaths, and marriages.
Boards of Education for England and Wales, Scotland and Ireland.	Educational matters, primary schools, school attendances, educational results, revenue and expenditure in connection with education."

If, as a preliminary step, it is desired to diminish the number of offices presenting statistics to Parliament, the above might be re-grouped as follows under the chief statistical departments, ignoring for this purpose the national divisions:—

1. *Treasury.*—Imports and exports. Customs and excise revenue and administration. General revenue matters, income tax, house duty, stamps, estate duty. National debt. Postal savings banks, money orders, and postal order business. Insurance. Industrial provident and co-operative societies. Building societies.

2. *Board of Trade.*—Home and Foreign trade. Navigation and shipping. Emigration and immigration. Railway capital and traffic. Railway accidents. Wrecks. Census of seamen. Tramways. Trade unions. Strikes and lockouts. Census of production. Labour exchanges and unemployment. Wages and hours of labour. Bankruptcy.

3. *Home Office.*—Mines and minerals. Accidents in mines. Industrial accidents. Factories. Criminal and judicial matters, prisons, reformatories. Aliens.

4. *Local Government Board.*—Local government, local taxation and expenditure. Pauperism. Population, births, deaths, marriages. Lunacy, lunatics, asylums.

5. *Board of Agriculture.*—Agriculture. Agricultural holdings. Area under and produce of crops. Live stock. Sea and inland fisheries. Corn sales and prices.

6. *Board of Education.*—Educational matters, primary schools, school attendances. Educational results, revenue and expenditure in connection with education.

7. *Imperial Defence Committee.*—Health of the Navy, Regular Army and Army Reserve, and the Territorial Forces.[11]

The chief statistical departments would then have to be placed under a central authority, with the power to suppress unnecessary or misleading statistics and fill up gaps, &c., and produce in place of the Statistical Abstract a proper scientific Statistical Year Book for the United Kingdom. The Committee of 1877–80 proposed the Treasury first and then a Board. But the Treasury unfortunately no longer enjoys the same authority as when this proposal was successfully resisted by the Board of Trade. Not only has it become a spending, and some think a spendthrift department, in regard to national insurance,[12] but it has not now the prestige and power necessary to reduce expenditure *proprio motu.* It has, as we saw in 1915, to call in the help of a Retrenchment Committee to assist it to do what was formerly considered to be par excellence the duty of the Treasury. This consideration takes us one step further.

After the war, it is obvious that we shall have to create some systematic supervision of our legislation and administration. Proposals for reform will have to be accompanied by some scientific estimate of cost. We shall not be able to afford to throw money away as we have done in the last quarter of a century, in which to take one instance our expenditure, central and local, on some categories of Public Assistance, has increased from 14,250,000*l.* in 1890–91 to something like 51,000,000*l.* in 1910–11.[13] The control of the Prime Minister over the Cabinet and the departments has never been real since Mr. Gladstone's last premiership. As things are, the Prime Minister cannot control the Cabinet and departments, unless he has, not merely a few private secretaries often men with little experience or knowledge, but, like all the European Premiers, a regular office of his own manned by the best permanent officials, an Intelligence Department for civil affairs answering to the Defence Committee, with its flexible system of skilled sub-committees appointed *ad hoc*.[14] To this department, the Central Statistical Department should be attached, and from this connection it would receive authority enough to overcome the official opposition of existing departments. That *vis inertiæ* can be measured if one reads the evidence before the Statistics Committee of 1879, particularly the examination of Dr. Burton, and if one reflects that Ministers now have less control of their departments than formerly. Sir Michael Hicks-Beach (Lord St. Aldwyn) was the last strong Departmental Minister who made his power felt right through his department. For this falling off, there are many reasons, such as the growing claims of Parliament on Ministers' time and the increasing complexity and technicality of business, but no one who has been actively engaged in public life with the departments in recent years will dispute the fact.

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[11] If the proposal made later to concentrate civil statistics under a civil Intelligence Committee is adopted, defence statistics will fall under the Defence Committee which would no doubt provide fuller statistics under this head than are now given in the Abstract.

[12] *Cp. supra* p. 34.

So much for the United Kingdom. When we turn to Imperial and foreign affairs, we shall find the same evils and the same remedy. There is the same lack of uniformity of statistics. There is no unit of time. The statistical year varies. In Newfoundland, it ends on June 30. In Canada, it ended on June 30 up to 1906; since 1906, it ends in Canada on March 31, which is the date fixed for the end of the statistical year in India and some of the principal Crown colonies, viz.:—Jamaica, Trinidad, British Guiana, and St. Vincent. On the other hand, in the United Kingdom, as we have seen, the statistical year ends on December 31, and the fiscal year on March 31. New Zealand and South Africa follow the lead of the United Kingdom but Australia, which adopted the calendar year up to 1914, has determined that in future the statistical year shall coincide with the financial year, namely, July 1 to June 30.

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[13] This return I obtained in 1913 by the help of members on both sides of the House of Commons, but it is very incomplete in its present form. It was republished in 1914 in a less complete form, but improvement cannot be expected in such matters during the war. *Cp. The State and the Poor, p.* 246.

[14] The reasons, apart from statistics, for the establishment of this Committee are more fully developed by the author in *Ephemera*, published by Smith, Elder and Co., 1915.

Some of the reforms of the Statistics of the Empire which are immediately desirable are :—

(1) A common statistical year.

(2) A common statistical method, including a common method of classification (*e.g.*, of metals and textiles), estimation of value and record of the origin and destination of goods.

(3) There should be an annual report of the trade of the Empire on a scale sufficiently large to give adequate details of the trade of all the oversea Dominions.

(4) In Australia we have the Year Book of the trade of the Commonwealth, and in Canada the Statistical Year Book of Canada, and in New Zealand the New Zealand Year Book, in South Africa the Annual Statement of the Trade and Shipping of the South Africa Customs Union, and these publications have brought about a certain amount of uniformity which might be carried further.

In the West Indies there is need of closer customs relations and a joint annual report. A common system should obtain in India, the Straits Settlements, and the other Asiatic possessions of Great Britain. Moreover, the information as to the Crown colonies is deficient and lacking in uniformity.

(5) It should be the rule to prefix a note to the statistical returns of each Dominion and Colony explaining the system of valuation, of registration, of origin and destination, inclusion and exclusion of transhipment and transit trade, bullion, specie, timber, coal, &c., and affording other comments to assist in the interpretation of statistics.

(6) There is at present, generally, no such reliable criterion as there should be of trade and production, and no means of establishing satisfactory comparisons as to the productive power of the several States of the Empire. To obtain such a criterion, import and export statistics should be supplemented by a system showing the internal trade and production of each Colony.

With regard to the Self-Governing Dominions, we have a recent official statement[15] which summarises the main divergencies existing between them and the United Kingdom in the form of the trade returns and the statistical content :—

1. *Form of the trade returns.*—Detailed statements of trade.

(*a*) Whilst the United Kingdom returns cover a period of five years, the Dominions's returns give figures for one year only, except in the case of those of the Union of South Africa, which give figures for two years.

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[15] Cd. 8156.

(*b*) In the case of Australia, New Zealand, and Newfoundland. the rate of duty is given against the return of dutiable articles. In the case of Canada and the Union of South Africa, this information is missing, and only the amount of duty collected is given. In the case of the United Kingdom, the rate of duty and amount of duty are only given in the separate tables containing the amounts entered for home consumption.

(*c*) The United Kingdom statements of the imports and exports of each article show the aggregate trade therein with other parts of the British Empire as distinguished from the aggregate trade with foreign countries. In the case of the Dominions (except Newfoundland), separate aggregates of the trade in each article with foreign countries and British Possessions, respectively, are not given, but the grouping of countries is such that these totals can easily be arrived at. In the Newfoundland returns there is no settled practice as regards grouping of this kind.

2. *Comparative tables.*—The United Kingdom, Canadian, and Australian returns give details of the quantity and value of the imports from, and exports to, each British Possession and foreign country over a period of five years.

New Zealand, the Union of South Africa, and Newfoundland do not give any such details.

3. *Monthly Returns.*—The information given with regard to imports (I) and exports (E) can best be summarised in the following table given in Cd. 8156.

y means information supplied.

n means information not supplied.

	By countries.		By quantity.		Value.		Compares month with month of				Compares period with period of			
							Previous year.		Previous two years.		Previous year.		Previous two years.	
	I.	E.	I.	E.	I.	E.	I.	E.	I.	E.	I	E.	I.	E.
U. Kingdom	y	y	y	y	y	y	y	y	y	y	y	y	y	y
Canada	y	y	y	y	y	y	y1	y1	n	n	y1	y1	y1	y1
Australia	n	n	n	y2	y	y	y	y	n	n	y	y	n	n
N. Zealand	n	n	y	y	y	y	y	y	4	4	y	y	4	4
S. Africa	n	n	y	y	y	y	y	y3	n	n	y	y	n	n

1. Comparative figures are given in the "Monthly Report" of the department of Trade and Commerce only, and not in the "Monthly Statements" of the Department of Customs.
2. For agricultural, dairy, and pastoral produce only.
3. South African produce only.
4. The returns have only commenced since 1914.

It will be seen from the above table that the United Kingdom alone gives comparative figures, month by month, and period by period, in respect of three years. The United Kingdom is also alone in giving, by countries, figures both of quantity and value.

Statistical Content.—(1) In the case of the statistical year, Canada and Newfoundland have not conformed to the practice of making their trade statistics coincide with the calendar year, and Australia, which previously conformed, has now decided that its statistical year shall coincide with its financial year. (*Cp. supra* p: 43.)

(2) In recording the direction of imports and exports, the differences are probably more apparent than real.

As regards imports, either countries of consignment or countries of origin are recorded, so far as possible, in all cases but that of Newfoundland. Newfoundland gives countries of shipment only.

Similarly as regards exports, either countries of consignment or of ultimate destination are recorded as far as possible in all cases but that of Newfoundland. Newfoundland gives countries of arrival (*i.e.*, first destination) only.

(3) As regards classification, the divergencies are so great that no summary is possible. All that can be said is that in practically all cases an alphabetical arrangement is adopted either wholly or within groups and classes.

(4) Finally, in the case of valuation whereas the United Kingdom values imports at their value at the port of arrival (c.i.f.) the Dominions generally take their starting point from the value in the exporting country. Australia and New Zealand, in most cases, add to the latter value a uniform 10 per cent. for freight and other charges of transport.

As regards exports, the usual practice is to take the value at port of shipment (f.o.b.). Australia and South Africa, however, have a different system. Australia values goods for export according to their value in the principal markets of the Commonwealth. The Union of South Africa takes the value of exports to be the cost at place of purchase, including cost of package.

These then are some of the difficulties as they now exist. Some of us have been pressing the simplification of Imperial Statistics on the Imperial Conference for more than a decade, and considering the great and varied programme the Conference had to discuss at its meetings in 1907 and 1911, we have no reason to be dissatisfied with the progress made as to Imperial Statistics,[16] but it is obvious that the question will become more pressing at the end of the war when projects of closer union are considered and the question of machinery arises.

If the proposal of a Civil Intelligence Committee for the United Kingdom is adopted and a sub-committee appointed to deal with the statistics of the Empire, it would be easy to transform it, as the Defence Committee has already been transformed, into a Committee for the Empire in connection with the Imperial Conference. The Prime Minister is President of the Imperial Conference, and in that capacity Imperial Statistics and an Imperial Statistical Abstract would best be placed under him.

There remain the statistics of foreign countries in so far as we have to deal with them. Here there are the same difficulties in regard to units of time, weight, value and quantity, the same difficulties as to definitions and classification (*Cp.* Colonies), though they need not be set out in detail. Here again the question of closer relations with our Allies after the war in trade and kindred questions will depend for its solution on the knowledge we can bring to bear. But here we do not stand alone. Whereas a new department, such as we have outlined, can deal with uniformity in the statistics of the Imperial trade directly, diplomacy will have to be called in if uniformity is to be obtained with foreign countries. There would, therefore, be requisite an International Conference.

Some steps have already been taken in this direction.[17] For some years, the question has been discussed of concluding an international arrangement whereby special trade returns should be drawn up by all countries on the basis of a uniform classification of imports and exports, with a view to the publication of the results in a comparative form.

Early in 1909, the Belgian Government invited other States to send delegates to an International Conference on the subject at Brussels. This took place in September, 1910, and His Majesty's Government was represented by Mr. Reade of the Customs. A draft

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[16] *Fortnightly Review*, December, 1905. *Imperial Organization of Trade*, 1911. *Ephemera*, 1915, pp. 258–97. Dominions Royal Commission Cd. 8156. Dominions Cd. 6091. Cd. 6863. Cd. 5273.

[17] Cd. 7351. It should be added that yeoman service has been done in this direction by the Institut International de Statistique founded in London, in June, 1885, of which one of our Vice-Presidents, Sir Henry Rew, is Treasurer. This institute has the pecuniary support of the principal civilized States, but the United Kingdom is, I believe, not a subscriber.

Convention was drawn up by the Conference, together with a model form of classification for adoption by the signatory States.

This form of classification consists of five main categories, each containing a number of sub-divisions, 186 in all.

The five main categories are as follows :—

1. Animaux vivants.
2. Objets d'alimentation et boissons.
3. Matières brutes ou simplement préparées.
4. Produits fabriqués.
5. Or et argent non œuvrés et monnaies d'or et d'argent.

The establishment of these model statistics in no way affects the right of each contracting country to continue to publish its own official statistics in any shape it considers desirable.

The Conference also proposed the establishment of a permanent bureau or secretariat at Brussels in connection with the scheme to whom the special returns should be sent, and who should be charged with their publication.

A second session of the Conference was held at Brussels in November, 1913, with a view to the final conclusion of the Convention, this country being represented by Mr. Macleay of the British Legation in that capital.

Certain alterations, mostly of an unimportant character, were proposed in the draft Convention which had been drawn up in 1910 and in the règlement d'organisation of the proposed bureau. The Convention was signed on behalf of His Majesty's Government on December 30. It has not been signed on behalf of the Dominions Governments.[18] The Convention permits, however, of the adherence of States which were not among the original signatory parties, and of adhesion on behalf of the Dominions and Colonies of contracting States. Australia was represented at both sessions of the Conference, but as stated above the Convention was not signed on her behalf.

The permanent bureau, when established, will have to be maintained jointly by the contracting parties, and the Treasury have already given their sanction to the contribution by the United Kingdom for the purpose of a yearly sum, which will, it is understood, not exceed 1,200 francs. This sum will be borne on the Board of Trade Vote. After the war, no doubt, further progress will be made especially with the Allied countries.[19]

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[18] Cd. 7351.

[19] The decisions of the recent Paris Conference are a matter of too much controversy to be discussed here, and at the time of writing the Committee appointed under the chairmanship of Lord Balfour of Burleigh to consider the resolutions has not pronounced an opinion, but it is safe to say that some such organisation as that referred to above is in the long run inevitable.

But, meanwhile, the Foreign Statistical Abstract might be considered in detail and expanded under the direction of a section of the Central Statistical Department.

My conclusion is then that a central direction of official statistics by a new department is urgently required, and that this department should be placed under an Intelligence Committee for the civil affairs of the Empire under the Prime Minister on the same lines as the existing Defence Committee which has done such good work before and during the war.

This department would consist of three sections:—(1) For the United Kingdom, (2) for the Empire, (3) foreign and miscellaneous. To each of these departments would be assigned a Statistical Abstract, and the department as a whole would eventually publish an Imperial Statistical Year Book, summarizing the three Abstracts, like those now published by great foreign States.

By means of the Abstracts, departmental statistics, which would continue to be presented to Parliament and published by the departments, would be subjected to constant revision and amendments, not as suggestions from another department with varying weight according to the position of different political and administrative chiefs, but as the result of the deliberations of a Committee on which the department would, if necessary, be represented, and which would be able at any time to command the assistance of expert statisticians like Dr. Bowley or great Colonial and Indian officials and statesmen.

If the desired system of reconstruction at home, of closer union with the Empire and closer relations with our Allies after the war, is to be realized, some such machinery will be necessary to place it on a sound and permanent basis.

It would, of course, be a great advantage if we could go one step further and realise the ideal set up by a Hungarian Economist in a paper read before the International Statistical Institute in 1905. "The "ideal conception of the future of statistics," said Professor Mandello, "consists in what may be termed the realisation of a French saying— "le livre de l'avenir, c'est l'office. Why not use the money and "energy saved by less printing for the transformation of all "statistical bureaux into real offices really rendering aid by answering "questions, inquiries? Why should hundreds and thousands of "busy people hunt in big volumes for statistical data, compile, "calculate, &c., making mistakes and hardly ever finding what they "really want, if their requests to know the figures for such and such "topics could be easily and with authority answered by the clerks "of the offices, or if they could be told that the figures looked for "were not known or the question raised not answerable statistically? "In supposing such a service, it would only be reasonable if answering "questions or furnishing special parts of statistics or doing some "calculations, would be charged for at reasonable rates, whilst "public bodies or institutions of a public character would be served "free of charge."[20]

Perhaps, that ideal may not be realized; perhaps, we may only live to see a slight reform of the Statistics of the United Kingdom, considering the little progress made in the last thirty-five years or so after the report signed by Mr. Childers, Mr. Arthur Balfour, and others. In any case, the whole of the work connected with our public statistics will not be absorbed by the State as some might fear, there will be ample work left to be done by other authorities and persons. A vast field will still be left for municipal enterprise. The first volume of the Comparative Municipal Statistics, published by the London County Council in 1915, shows that municipalities must take up the subject not only in the interest of economy and efficiency but also as a defence of their interests against the State.

Private enterprise will always be required on the part of Societies like ours, as well as on the part of individuals like Dr. Bowley and others who have done such yeoman service in the past two decades. If eternal vigilance is the price of liberty, eternal criticism is the price of truth.

Note.—An exhaustive account of the statistical work done in Foreign Countries by the States, municipalities, societies, and individuals, was given by Mr. J. Biddulph Martin in his Presidential Address to the Royal Statistical Society in 1896, *Journal*, Vol. LIX. The subject is also referred to in Sir Charles Dilke's address, Vol. LXX, Part IV. The experience of foreign countries, as well as that of our own sister States, is in favour of the centralization of statistics, but the case is so strong on our own evidence that there is no need to make comparisons. How much is owing, even in the German Empire, to private initiative can be gathered by a glance at (1) the *Statistisches Jahrbuch Deutscher Städte*, and (2) the *Kommunales Jahrbuch*. The former deals with fifty German cities with above 50,000 inhabitants and having a proper municipal statistical bureau. The latter deals with all German cities with above 5,000 inhabitants, now about 1,500 in number. Neither the one nor the other is an official publication in the proper sense of the word. The *Statistisches Jahrbuch* is published by Professor Neefe and is only subsidised to the extent that a certain number of copies are regularly bought by the Deutscher Städtetag (the Union of German Cities of above 20,000 inhabitants). The *Kommunales Jahrbuch* is an entirely scientific work privately published by Dr. Lindemann and others, but on the basis of official material.

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[20] *Journal of the Royal Statistical Society*, Vol. LXVIII, 1950.

Discussion on Mr. Geoffrey Drage's Paper.

Dr. A. L. Bowley, in proposing the vote of thanks to Mr. Drage for his Paper, said he thought they were most indebted to him for his courage and optimism in bringing forward this subject once again and, of course, for his careful analysis of some of the principal defects in existing statistics. It was a melancholy reflection that not only this Society but other bodies had for very nearly forty years seriously tried to obtain this reform which Mr. Drage had proposed to them again to-night. In 1907, Sir Charles Dilke opened his campaign with a fair hope, it was thought, of some success, but since that date nothing effective had been done towards harmonising statistics. A good deal had been written, and a good deal of evidence and some important and practical suggestions were given to the Dominions Royal Commission. But of practical effect towards the constitution of a central statistical body or the issue of a Year Book for the United Kingdom, there was, so far as he was aware, no sign at the outbreak of the war. Of the necessity of this change every person who had, however remotely, had to do with any part of the organization of the Empire for defence must have been convinced again and again. He only wished that he could say that the discretion and intelligence needed for the effective collection and presentation of statistics had manifested itself during these last two years. Everybody who had been in any way concerned with public statistics during that time knew that every kind of fault that Mr. Drage had alluded to in his Paper had been prevalent throughout the whole system of administration. This was common knowledge, and the results in the way of misleading calculations and mistakes and forecasts had been abundantly shown. They were all agreed, and every member of the Society and every practical statistician working in the Government Departments agreed, that the reforms which Mr. Drage had indicated and on the lines which he had indicated were necessary. But where was the driving power which was going to bring this about? Where could we look now to find a driving force which did not exist in 1907 nor in 1880? Mr. Drage told us that public opinion was the real driving power in the State, and that was, he feared, where the weakness would be found. He did not think that owing to public opinion the front pages of the halfpenny press would be devoted to the advocation of a Central Statistical Office in the year after the war. If they were not, he confessed he did not know where the driving power was coming from. But some person more versed in public agitation than himself and knowing better who had the ultimate power to produce these things would, he hoped, take up this campaign, direct it, and bring it to a successful conclusion. He thought it was suggested in Mr. Drage's Paper that he, at any rate, would not be uninterested in taking part in the initiation of this campaign, which he had already tried to forward here and by other means. But there certainly was a danger that this Paper, and the President's Paper of last month, would be accepted—people would admit that the thing was wise and should be done—and in 1927 we should meet again, we should allude to this Paper and the Paper of 1907, and a few remaining people would say that they remembered the Paper of 1880—we should all say just the same thing. At least that was his fear. When the Central Bureau of Statistics was formed—and he was not really so pessimistic but that he thought that some kind of central authority might be formed in the near future—it was of the first importance that it should have real power. Departments were extraordinarily powerful. There were many people, he thought, who liked compiling statistics and who understood the subject matter as to which they were giving information, and, very naturally, they were not convinced that another Department or another group of people would do the same thing better. There was nothing but praise to be given to the enthusiasm with which these very arduous enquiries were worked out. But when it came to viewing the thing from the supra-departmental point of view, it was invariably found that the contributions of the various Departments were either not watertight or were overlapping ; and, however well the Department produced its statistics, not only for its own information (perhaps a little over-emphasis was laid on that by the quotations from the earlier papers) but for information on the particular problem in hand, there would still be an enormous amount lacking before the statistics that related to all the aspects of the problem could be brought together and really intelligent action based upon them. The needs of the public were not the same as the needs of the Departments in this respect. The Departments needed information on which to act ; that is to say, to carry out the administration which was entrusted to them. The public needed information on which to think. And that was quite a different matter ; because the particular reform or administration which was entrusted to the Department was only part of the whole, and we had continually to be watching for the omitted parts. That need not be laboured because he thought everyone here was aware of it from the practical experience of trying to piece together the statistics which related to subjects in which they were interested. To return to the statement that public opinion was the real driving power, the fact was, of course, that the public did not understand anything about it. They confused statistics with facts. They said, "Let us get the facts" and then they took statistics. We constantly heard that. Nobody here would, he thought, confuse statistics with facts nor would they confuse them with fiction, which was the other extreme. They were not the same thing at all. Politicians had the same view. They said, "I have the statistics here," when some table had been given and some information compiled ; but it did not make a picture and it was not what was wanted. Outside of this Society and certain other Societies, and outside certain groups of people who had used statistics as an organic weapon, it was not understood that statistics do not consist of tabular matter and that alone. When there was a Central Statistical Bureau there would still be needed another reform which was a little outside the exact scope of the paper, but not altogether outside, because Mr. Drage had alluded to the harm done in some statistical tabulations by the employment of uneducated and uninterested persons. He did not think that this Society ought to be satisfied with the degree of statistical education possessed by the Civil Service. He did not mean that there was universal ignorance of statistical processes in the Civil Service; but he did mean that an enormous number of persons, not merely tabulating clerks, filing clerks, and those who were carrying out definite instructions, but in the higher grades of the work, had no real knowledge of the nature and purpose of statistics. And it would be marvellous if they had. The Second Division clerk did not, he believed, learn statistics at all. He learnt arithmetic, at which he was expert, and he became a wonderfully expert tabulator. But he did not know that there was any such thing as the science of statistics. There was no reason why he should. He would not find any trace of it in his office. He would not have any means of education in the matter. Statistics to him meant the compilation of tables under instructions. There were, he believed, now in the examination for First Division clerks some questions put on the theory and application of statistics. The subject might be taken, but it was not in any way compulsory, he thought; and even if those questions were taken, he had yet to be told that a person who showed aptitude in statistics in the Civil Service examination was given statistical work to do in any office He had yet to be told—perhaps somebody here could tell him that—that in seeking out the most suitable First Division clerk to be in charge of important statistical investigations, reference was made to his performance in his examination or to any other sign outside his office work that he did understand statistics as a science. It might possibly be the case, but it certainly was not when he last tried to make an enquiry into the matter. The excellent work that was done from time to time was done in spite of the system. If we had not skilled statisticians in the general ranks of the Civil Service applying their skill to statistics, then we could not even have departmental statistics in any way perfect. This was not entirely a digression, because he wanted to suggest that there was some sign in Mr. Drage's Paper that he had not given at any rate the emphasis he (Dr. Bowley) would desire to the need of statistical knowledge in the Central Statistical Bureau. There were to be super-administrators; there were to be people who would be of standing to meet on equal terms the representatives of the Departments. But he did not know that there was an actual suggestion that the Central Statistical Office should, in fact, be a body of trained statisticians. He did not think that one could assemble that body very rapidly. No doubt one could find in the Civil Service many persons who had looked on statistics as a science and more than an assemblage of facts; but very careful selection would be required. If the Central Office working as part of the Intelligence Office was composed of serious statisticians, then there was another point which had not been suggested in the Paper, but which he thought Mr. Drage would readily accept, that he should have an office of educated statisticians who would take and put together and criticize and interpret the returns from the various Departments, and that this Central Statistical Office should be the real office, not merely for answering enquiries, but also for working up the returns. He pictured this as a machinery office, and thought there would have to be a considerable number of machines in it. There were very few in the Government service at the present time. There should be every aid to calculation, and then we should be able to get our returns more quickly as well as more adequately. There was one special reason why it would be advisable to start with this new system immediately after the war. With a breach of continuity in statistical administration there was always a difficulty in carrying figures through; and in all practical statistics there would be an enormous breach in continuity from the mere fact of the war. The figures for 1917 would not be directly comparable with the figures of 1913 before the break. And therefore it was a suitable time for making a breach with tradition; for the difficulties that were bound to exist would be of less relative importance at such a period than at others. He had intentionally not tried to follow Mr. Drage in the actual details of the work. The essential need was to get public and political opinion in such a position that the reform would become practical politics, and for Mr. Drage's efforts towards this end he thought we should vote him the thanks of the Society.

Dr. J. C. STAMP seconded the motion. He was sure that all felt that Mr. Drage had, in sketching out this subject, again used a very broad outlook. But while it was broad it was by no means vague. He had a very sure touch, and one could confidently say that he had probably mapped out the full extent of the sphere of influence that this project was likely to attain in the next one hundred years. He imagined that in the extension to the Empire of the co-ordination of figures, the farthest possible step that was really legitimate at the present time, even as an aspiration, had really been taken. He admired Mr Drage's courage, but he noticed there were limits to it. He saw present that evening many representatives of Government and Municipal statistics, and Mr. Drage might have added a great dramatic interest to his Paper if he had placed the Government tables in order of merit! Although this subject had been many times touched upon before, it was undoubtedly necessary to keep it alive continually until the happy moment came when it could really enter into full fruition. He thought at the present time it really had a good prospect of being a live subject. But anything that was to be done must be done early, and the earlier the better, at the conclusion of the war. As Dr. Bowley had said, it was a propitious time, because a break had to be made with the traditions of the past and it could be made now with less effect than at other times, and for a reason which Dr. Bowley did not give, a reason additional to those that he had given. That was to say, in some of the Departments the Statistical Section has practically ceased to exist, and had been shut down because the clerks were at the war. After the war there would be nothing in the way of returns and reports, but a mass of attenuated and abbreviated pamphlets giving the baldest of information. So that when the time came to re-start the scheme there could be nothing like the opposition from what one might call the vested interests, from *amour propre*, or anything of that kind, that there would otherwise have been. That would all be gone, and from that point of view, through the natural break that had occurred owing to shortage of labour in the Government Offices, there arose an opportunity of starting this scheme after the war that there would not be at any other time. Those who affected to despise statistics (and most of all those who apply that very hackneyed definition to them!) would be the first, as they always were, to wish to apply the statistics to their practical propositions; and those who complained most of the expense of what they would regard as unproductive labour, and as being an unnecessary expense at a time when economy was very important, would be the first to complain of the *defects* in the existing statistics. And yet the fact remained that if we did not get something really sufficient and something on which we were bound to spend money even to the terrible extent of 1,200 francs a year, then all our reconstruction after the war would be somewhat chaotic. He thought it was Mr. Graham Wallas who, in his *Human Nature and Politics*, remarked that the heated controversy following the Tariff Reform movement would have been absolute Bedlam but for the two Board of Trade Blue Books. They did give at any rate some kind of direction and relevancy to the remarks that people urged about some of the figures. With regard to the outlook of the Paper, he thought it should be understood that the centralization and co-ordination that was proposed was primary only in this case. He was rather appalled at the prospect arising from that quotation from Professor Mandello. It might be an excellent idea to have a statistical abstract far better than the present one, approximating even to the Yearly Report from Japan or to the London County Council. But he did not think they ought to lead the public to suppose that it was going to be labelled "Statistics Without Tears." The public must not expect that they were going to produce volumes from which anyone could skim off their inferences or their generalizations without any effort or thought on their part. After all, it was the people who did that sort of thing so readily and so deftly, as they thought, who brought statistics into ill repute. It would still be necessary for people to study carefully what they were doing. They should stipulate for the correctness of figures and the co-ordination of methods by all means; but to leave these people to suppose that they could obtain all the material for their political projects and inferences and so on without spending some time on their selection and arrangement would be doing a vain thing. It had been remarked by Sir Leo Chiozza Money that there was hardly a page of the Statistical abstract that an uninstructed person could go to without danger of making grave blunders. He thought that was true. It was a mistake to let people think that those results were to be won without effort. He gave an instance of a person recently referred to him who had conceived a sudden idea on the land question, and wanted some information and statistics. He (Dr. Stamp) went through some figures with him, and then found he was grumbling very much because of the operations he had to perform himself on the raw material, and he thought that ought to be done in the book itself. He (Dr. Stamp) said, "You will "never say anything worth listening to about these figures until "you go away and get a headache over them." He believed the more it was rubbed into people that statistics is to some extent an esoteric science, and not a thing consisting only of tabular statements and collections of figures, the more respect they would have for it. Dr. Bowley had referred to the officials who had to apply their time to Government statistics. Many of his remarks had caused representatives of Government Departments in that room to quail under his righteous lash. There was a great deal of truth in them, though less and less as years went on. One had only to think of the names of some of the men who were in charge of the leading branches of national statistics to know that for the most part they were in safe hands. He did know, however, that in some Departments where statistics were not a very prominent section of the work the statistical side was regarded as the side to which any clerk could be drafted, and that it did not require any more knowledge than that of arithmetic or drafting letters or any other branch of organization in the office. It was not regarded now as being anything more than addition and tabulation. The idea of bringing in any new ideas or new schemes in regard to statistics was not an idea that would be welcomed in many offices. That attitude, however, was being broken down. He thought it was rather important to emphasize the necessity of making this idea quite palatable to politicians and the public generally. As regards the expense, he thought it should be attached to the Intelligence Department, that it should be called "Intelligence," and not "Statistics." He would keep the word "Statistical" out of it for three or four years, and then introduce it surreptitiously. He thought that if you called it the Intelligence Department it would appeal to the public far more than if it were called the Statistical Department; to attach to it that title was to do a great deal towards recommending it to the public. There was another way in which it might be recommended which had not been mentioned, and that was that it would entail a positive financial saving. There must be in many of the Departments small sub-Departments which were run for statistical purposes with a small number of men on the staff, but there is not enough full-time work for the clerks who filled in with the work, and for statistics they were not in any respect equipped or ready. As a small Department would never think of doing its own printing, so it would be quite possible for a staff to be attached to this Central Office for the work of tabulation and calculation. The Central Office would keep constantly employed all the year round a skilled and well equipped staff with adding machines and calculating machines, which might properly and economically be adopted in such a Department. The cost of upkeep of such a staff would be quite reasonable, and it would mean a material saving in some of the smaller Departments. He thought also that the Central Department might economise and not multiply statistics. There must be very many annual reports in which there are very slight variations in the figures, and it would be the duty of the staff of the Central Department to note those variations and so to tabulate them that a table which varied only in one or two figures from another table would not need to be printed *in extenso* every year, but perhaps the triennial or quinquennial variations would be shown in an estimated and interpolated form. On this Department would be thrown the task of "educating" the Government Departments, and perhaps of undertaking for them all the work which need not be done as a complete census or comprehensive calculation but was suitable for sampling. From his own experience he knew it was quite possible to obtain a result sufficiently accurate for the purpose in view with one-tenth of the work required for covering the whole field, and certain things might be undertaken by a process of sampling under skilled direction of a Central Office, upon the committee of which the Department itself was adequately represented.

Mr. H. V. Reade said that Mr. Drage had given them a very interesting and stimulating Paper. He was particularly interested himself, being one of those unfortunate Government officials who had come in for rather hard words this evening from more than one speaker. His office was responsible for the import and export statistics, and also the customs and excise statistics, to both of which reference had been made in the Paper. Personally he believed that a Central Statistical Office on the lines which Mr. Drage had indicated would be a most admirable thing. Nor did he think it quite fair to argue, from what took place in 1887, that there would necessarily be obstruction to that suggestion on the part of Government Departments. There would be no obstruction from his Department, at any rate, if he could help it. But the work of that Central Department in relation to the other Government Departments would certainly be difficult. He thought that among the qualifications of the staff, in addition to statistical ability, there should be a great deal of those valuable qualities known as tact and discretion. They would have the duty of carrying through that difficult process, which is commonly called going to other people and teaching them their business. This might be required in a great many cases, but it was certainly not easy to carry it out without that friction which generates heat. If the driving force that was to create such an office was to be public opinion, he was afraid the obstructive force might be found in the Treasury, which would look at the cost, and he could only hope that Mr. Stamp's view, that the result of the establishment of the Central Office might really be an economy rather than an additional expense, would be accepted to a sufficient extent to allow such an office to be established. It would certainly do very valuable work in correlating the statistics of all the different Departments, in compiling books of reference, and in seeing that the tables in the various Government publications were published with proper explanations, and so on. One of the things it might take in hand, as he thought Mr. Drage more or less suggested, was the publication of a sort of guide showing what statistics were already in existence. That would be extremely valuable to all who dealt with public affairs, and would incidentally save a lot of time to Government Departments ; because the public ignorance as to what statistics were already in existence was almost incredible. Mr. Drage had referred to the fact that even Members of Parliament often asked for figures or other information which already existed in reports presented to Parliament. Similarly one found that in debates, on such subjects as the tea duty, some members were evidently unaware of the existence of the annual Customs and Excise Reports, which were the main source of information on the subject. If a Central Statistical Office could issue a kind of "Guide to Statistical Knowledge" which could be distributed to Members of Parliament, and others, it might save much time not only to the Departments concerned but also to the business of the country. On the whole, the reader of the Paper was very complimentary to our import and export statistics, and he thought the table which he reproduced from the Report of the Dominions Royal Commission showed that we "came out "top" as regards monthly trade accounts, both as to the extent and variety of the statistics, and the fact that we gave the figures of three years for comparison. It might be added that we brought ours out much more quickly than any other country. So after that he confessed he was a little surprised and rather hurt to find that Mr. Drage proposed to abolish him. The re-arrangement of the duties of the Departments so far as statistical work was concerned, which he sketched out, apparently involved the disappearance altogether of the Customs and Excise Department. The imports and exports were to go to the Treasury along with customs and excise revenue and administration and so on. But perhaps that was merely a slip. It would, as a matter of fact, be quite impossible to dissociate trade statistics from the Customs Department. All the data are collected by Customs officers and the Statistical Office had to be in daily touch with them, and, through them, with the importers and exporters. He thought Mr. Drage rather supported some of the complaints made at the time of the fiscal controversy in 1903 as to the absence of statistics which controversialists expected to find. For instance, it was pointed out that there were no statistics about dumping. He confessed that he did not see how such statistics could be compiled while we had our present fiscal system. In Canada they had an anti-dumping law and presumably means for identifying dumped goods. But if you took as "dumped" those goods which were sold at no profit in order to get trade, it was obvious that we could not find out what goods corresponding to that definition came into the country. Another criticism made was about the classification of goods as manufactured or not manufactured. He supposed that was one of the most difficult of all questions in the classification of goods. This was shown by the classification of the Brussels Conference to which Mr. Drage alluded. We divided goods into "raw materials and goods mainly unmanufactured" and "goods "wholly or mainly manufactured." The division suggested by the Brussels Conference was, as Mr. Drage stated, into "Raw "Materials and materials simply prepared" and "Manufactured "goods." This might appear to be the same, but in point of fact it proved to be widely different. It was impossible, in fact, to draw a clear distinction between goods "slightly" and goods "mainly" or "wholly" manufactured, and he doubted whether a Central Statistical Office could help much. Another criticism related to the absence of statistics of trade between Great Britain and Ireland. That was largely an administrative question. You could only get complete statistics on the lines of statistics about foreign trade by making the masters of vessels going to and from Ireland submit to much the same formalities and restrictions as the masters of vessels arriving in this country from abroad, and that was largely a matter of policy. The statistics about this trade now published in Ireland were, he believed, supplied voluntarily by Dock and Harbour Authorities. Nothing, he feared, could prevent the misuse of statistics, and it was peculiarly painful to those of them who were concerned with the import and export statistics to observe the extraordinary way in which they were handled during the Fiscal controversy. They had no power, of course, to step in and put people right, but were compelled to observe the rigid impartiality of a Government Department. Coming to international statistics, he had the honour of representing the country at that Brussels Conference in 1910. There one was struck at once by the fact that every other country's classification of statistics was governed mainly by its tariff, rather than by purely statistical considerations. The result was that most of the Continental statistics differed widely from ours. Moreover the fact that they have extensive tariffs, and therefore a far more thorough examination of imported goods, enabled them to go into far more minute classifications than we could. There was the difference just mentioned with respect to classifications of manufactured or partly manufactured and wholly manufactured goods; there were various methods of valuation; there was the system of classifying imports according to the country of origin and according to the country of consignment, which might be a very different thing. Of course, there was no power to make our various colonies conform to one system; still less was there any power to compel foreign countries to do the same. It would all have to be done as a matter of international agreement, and it would be a very difficult task. But he thought that the arrangement sketched out at the Brussels Conference and embodied in the Convention marked a considerable advance in the unification of international statistics, and he only hoped that after the war this task would be resumed.

Mr. S. G. Warner (President of the Institute of Actuaries), in supporting the vote of thanks, said he would like to do so for the reason that he represented an interest which was not always directly represented here, namely, that of the actuary. He was not capable of criticising the paper which had been read, in any shape or form. But actuaries were interested in the scheme which it advocated, as students of vital statistics, which were of primary importance to them. Actuaries had for a long time past been advocating what appeared to them to be Census reforms, and while that advocacy had not been unsuccessful, for some of the most valuable of these (notably the individual age-tabulation) had been obtained, enough remained over to lead them to welcome such a project as the paper suggested. It had been brought home forcibly to them of late how important it was that full statistics as regards, for instance, rates of sickness in the community should be at their disposal. The instance referred to that of the National Health Insurance Act. As they all probably knew, the experience of female sickness had exceeded the assumption made in the figures upon which the financial part of that Act was founded. That was entirely owing to their having been unable to get any reliable statistics on the subject. Assumptions had to be made, and those assumptions have proved to be short of the facts. Fortunately, the Committee which had been sitting lately on the subject had found that, owing to the elasticity of the scheme which was devised, it was possible to adjust the difficulty with comparatively little disturbance. The eminent actuaries who were consulted in the matter were men who thoroughly understood their business. One of them, the late Sir George Hardy, was a mathematical genius whose reputation far exceeded the bounds of his profession. It could not be too widely made known that the discrepancy was solely due to the fact that proper statistics were not available. So much for the past. As regards the future, they were earnestly desirous that something might be done, and done soon. Dr. Bowley seemed to be very hopeless about that, and suggested that decade after decade might pass leaving them in the same position as now. It seemed to him that after the present period of war, they would undoubtedly have to embark upon national schemes of reconstruction, and that they had thus a very powerful argument to urge at the present time, and a very good hope of getting something practical done. As actuaries it seemed to them that there were great possibilities in the future on account of the work to which the nation would have to set its hand. There were probably many risks which could be met by some system of insurance, but which at present could not be dealt with for the simple reason that no statistics were available. Such a scheme a had been suggested to-night might do a great deal to put us in possession of those statistics; and if that could only be done there was every prospect that they could be effectively used. One of the most striking developments in the immediate past had been that so many of the younger actuaries had directed their energies towards the scientific study of statistics. This had been stimulated by the influence of Dr. Karl Pearson's study and advocacy of "frequency "curve" methods, and there was every prospect of fruitful results. For such reasons they earnestly desired that something might be done in this direction without delay. It was quite true that in the past these pleadings had fallen largely upon deaf ears, and that departmental or official circles had not been very much moved by them. But we had never been in a position like this before, and the problems facing the nation were such as it has never had to face before. In these circumstances it was to be hoped that a plea of this kind, by no means trivial, sectional, or professional, but for the entire national good, would have a national result, and that we should thus be able to promote the national welfare. He had very much pleasure in supporting the vote of thanks.

Mr. John Baker, in supporting the resolution, said he wondered whether something could be done in this matter. Was the paper going to be sent to responsible Ministers, or would a deputation be appointed to take it to them, or were they going to be content just to read it and leave it where it was? New members of the Government were being appointed who could not possibly have any preconceived notions on the subject because they had never studied the matter; but these men were going to be influenced by the Departmental Officials who had preconceived notions, unless some other influence was brought to bear on them. These new men were strong enough to alter departmental methods if they were approached in the right way. There were six different years under the National Insurance Acts. This had been so troublesome to him that he made complaints, and these complaints on his part and on the part of other people had had an effect on those in power and had led them to alter things. They had sufficient dynamic force in this room to get things altered if they wished it. Some immediate and definite steps ought to be taken to draw the attention of the proper persons to the desirability of this reform. He was not an actuary nor a statistician, but he was one of those people who found it difficult to digest the food which the Departments put before them. He was of the opinion that we ought to abolish a lot of the "classes" under the Insurance Acts. He wanted to find out the numbers in those classes, but found that England had one method of dealing with them, Scotland another method, and Ireland still another, and that there was no possibility of finding out from the published returns, the numbers in each of the different classes. It would be preposterous on his part to ask for the abolition of a class containing several millions of people, but there were classes, so far as National Insurance was concerned, with only two or three members, and they had to do just the same sort of things in regard to those two or three people as they had to do in regard to the millions; therefore, they ought to combine these classes as far as possibly can be done. Another question that affected him as an administrator was this: Large numbers of stamps were purchased to stick upon cards which were lost; large numbers of stamps were purchased and never stuck upon cards at all, and large numbers of stamped cards reached the Insurance Commissioners that could not be identified with any particular person. Numbers of cards with stamps on never did reach the Insurance Commissioners. Now what he wished to find out if possible was the number of stamps that had been purchased by and on behalf of the insured persons of this country; because that money belonged to them and not to the Postmaster-General or to the general tax-payer. But he could not find that out, nor did he know where to go to find it out. In the evidence given before the unofficial Commission he was struck, and they were struck, with the evidence on depreciation of investments. A rough estimate was that it was two million pounds. They tried to find out. Then they found that there had been no figures published of the investments for the year 1914. Questions had been asked across the floor of the House of Commons, and they found it exceedingly difficult to get anything like an accurate estimate of the depreciation in those funds. The last estimate was that on an investment of thirty million pounds there was a depreciation of four and a half million pounds. That was a most serious position so far as the approved societies were concerned, and the officers of those societies were entitled to know how much depreciation there was, and the position they were in. They could not find it out with the present methods, so far as he was able to judge. He was not quoting his own opinion alone; he had a friend who was an actuary who advised him on these matters, and he was not able to find out the position, although the question had been raised in the House of Commons. Therefore, he hoped they were not going to wait until after the war. Personally he did not want to wait until after the war to ask for the reform proposed by Mr. Drage. We ought to take steps now. As a matter of fact, the Insurance Act was affected by the sickness rate in consequence of the war. The amounts of and methods of paying pensions did not please him. Within about four days of Mr. Barnes' appointment he went with others on a deputation to see him. He wanted to know whether Mr. Barnes was not going to increase the pensions so as to take some of the men off his books. As things were at present, they were taking money from his funds that were never provided for this particular sickness under the Insurance Act. If they approached some of the new Ministers they might be able to get something done.

The Chairman remarked that as it was getting so late he would not attempt to say all he intended saying, and would leave untouched the points he would otherwise have referred to which had been raised by speakers in the course of this most interesting discussion. He had been fully in sympathy for many years with those who wished for a reform in this direction, and he would agree, as far as he could see, with a great deal that Mr. Drage had said. He really only rose for the moment to say that he thought the whole matter so important that he would be very sorry if they did not do anything in regard to it. He thought the Society as a whole ought to take some action in accordance with the ideas of the last speaker, to prevent it being a "shot in the air," to use a phrase of Sir Charles Dilke's in speaking of his own paper. It had been suggested that this meeting should pass a resolution in its favour, but this would be contrary to all precedent, and he did not think it would be effective. The other alternative was that they should appoint a strong committee to go into the question. The only difficulty was that the people who would be of use on the committee were all so much engaged in war work for the Government that he did not think they could get them to give the necessary attention to the matter. He did not himself see what alternative there was to postponing the appointment of this committee until after the war, nor did he think a mere resolution sent to Ministers would be of very much use. If they hoped to get anything done, they ought to produce a reasoned scheme of some kind, or practicable suggestions, and he did not think they could do that as the result of this incomplete discussion this evening. He was most anxious that some action should be taken, and he thought they certainly ought to take it. But he did not know whether they could do more for the moment than ask the Council to pass a resolution, stating their intention to appoint a strong committee to investigate and report on the whole question as soon as they could find members of the Society free to give their attention to it. He would be very glad, however, to receive suggestions from Mr. Drage or from any other Fellow on the subject, with a view to doing something if it were possible. He would now put the vote of thanks to Mr. Drage, moved by Dr. Bowley, and seconded by Mr. Stamp, to the meeting.

This was carried unanimously.

Mr. GEOFFREY DRAGE (in reply) said he was extremely obliged to the numerous Fellows of the Society and others who had attended, and to the gentlemen who had been so kind as to speak. He quite agreed with Mr. Reade and Mr. Baker that it would be a thousand pities if no further action were taken. It might be well to forward the paper, or an abstract of the paper, to the new Cabinet of five members, which contained, in Lord Milner, a statesman very much interested in our problems, and highly competent to deal with any of them. The question would probably then be relegated by the Cabinet to the Committee which has been set up to consider the problems of re-construction, and the re-construction committee would be asked to report on it. Under the Cabinet of five the question will be even more vital than hitherto because there would not be the constant individual departmental touch which the Cabinet of the twenty-three had had. Therefore, it might be well, subject to any rule of the Society there might be to the contrary, if this meeting were to recommend the Council to forward a copy of the paper, with any endorsement the Council might see fit to put upon it, to the Cabinet, and they must then hope that, if all they wished for was not done, at any rate that some substantial step would be taken before the conclusion of the war. As Dr. Bowley and Mr. Baker had pointed out, statistical reform was required for the military and civil purposes of the Government during the war, as well as for reconstruction after the war. He was extremely grateful to the meeting for their reception of his paper, and for the kind things they had said.

The CHAIRMAN said he thought we might perhaps take the action that Mr. Drage had suggested, and recommend the Council to forward his paper to some authority considering these questions. He would be quite prepared to mention it to the Council at their next meeting.

Mr. JOHN BAKER asked if it would not be wiser to have a deputation to take the paper straight to the Minister concerned, and to urge upon him that something ought to be done. If it were sent officially from here it would probably have more effect.

The CHAIRMAN said he thought they might consider the method between them how they should approach the Government about it.

The undermentioned candidate was elected a Fellow of the Society :—

The Right Hon. F. Huth Jackson.

ON THE MATHEMATICAL REPRESENTATION OF STATISTICAL DATA.

By Professor F. Y. EDGEWORTH, F.B.A.

SECTION III.

On the Relation between the Generalized Law of Error and the Method of Translation.

IN the preceding sections* it has been shown how to obtain from the data the constants pertaining to each of two leading forms. Which of these constructions is preferably to be adopted in any given case must next be considered.

The subject is divided by the broad and deep, though not sharp, distinction which separates the cases which are amenable to the generalised law of error, the normal and subnormal curves, as they may be called, from the abnormal cases which lie beyond.

1. *Subnormal groups.*—The essential property of the first class is the capacity of the ordinate to be represented by a certain series over a considerable tract of the area. What the extent of that tract is, it now concerns us to state more carefully than heretofore.

It is shown in previous papers† that the frequency of a quantity dependent on numerous more or less ‡ independent causes may generally be represented by a series of which the symbolic expression is

$$e^{-\frac{1}{3!}\mathrm{k}_1\left(\frac{d}{dx}\right)^3+\frac{1}{4!}\mathrm{k}_2\left(\frac{d}{dx}\right)^4,\ \&\text{c.}}\,y_0$$

where y_0 is the error function $\frac{1}{\sqrt{\pi}}e^{-x^2}$ and k_1, k_2, k_3, &c., are constants forming a descending series. In initiating some further reflections upon this law let us at first abstract—promising to restore later—the coefficients subsequent to the first k. That constant we shall here, as sometimes elsewhere, § call j. We may without loss of generality take j as positive, since its sign is conventional ;

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* *See* Sections 1 and 2 in the *Journal of the Royal Statistical Society* vol. LXXIX (1916), hereinafter referred to as "*ante.*"

† *See* "The Generalised Law of Error," *J.R.S.S.*, vol. LXX (1907) ; based on the "Law of Error," *Camb. Phil. Trans.*, 1905.

‡ *Cp. ante J.R.S.S.*, vol. LXXIX (1916), p. 462.

§ *Cp. J.R.S.S.*, vol. LXXI X (1916), p. 459.

depending on the convention as to which side of the origin is to be regarded as positive. A curve for which j is positive according to the usual convention about signs becomes a curve for which j is negative, when viewed from behind the paper (through the paper). Thus y representing frequency for the group under consideration is equatable to

$$e^{-\frac{1}{3\,!}\,\mathrm{j}\left(\frac{d}{dx}\right)^3}\frac{1}{\sqrt{\pi}}e^{-x^2}$$

where x is measured from the centroid (centre of gravity) of the group, the unit employed for the measurement being $\sqrt{2\mu_2}$ (the square root of twice the mean square of deviation, the constant which would be called the *modulus* if the group were normal). Now consider the expression for y as a function of j, with x (for any assigned value of the abscissa), as a constant, say $y = \mathrm{F}(\mathrm{j}\,;x)$ or simply $y = \mathrm{F}(\mathrm{j})$; and expand in ascending powers of j according to Taylor's theorem. Thus $y = \mathrm{F}(o) + \mathrm{j}\,\mathrm{F}'(o) + \frac{1}{2}\,\mathrm{j}^2\,\mathrm{F}''(\mathrm{j}_1)$; where $\mathrm{F}'(o)$ is the result of differentiating y with regard to j and then substituting o for j, $\mathrm{F}''(\mathrm{j}_1)$ is the result of differentiating y twice with respect to j, and then substituting for j a quantity between j and o, say $\theta\mathrm{j}$ or j_1. The first term in this expansion forms the normal law of error. The first two terms form the second approximation (to the actual frequency) presented by the generalised law of error, sometimes called y_1. The third term represents the *remainder*, which is left when we substract the second approximation y_1 from the actual frequency. To consider the magnitude of this remainder let us write $\mathrm{F}''(\mathrm{j}_1)$ in the form

$$\left(\frac{1}{3\,!}\right)^2\left(\frac{d}{dx}\right)^6 e^{-\frac{1}{3\,!}\,\mathrm{j}_1\frac{d^3}{dx^3}}\,y_0$$

(the result of differentiating $\mathrm{F}(\mathrm{j}_1)$ twice with regard to j_1. Here the operand which is placed after the operatar $\left(\frac{d}{dx}\right)^6$ is what y becomes when j_1 is substituted therein for j; say $(y)_{\mathrm{j}_1}$ or more simply (y). Since (y) is a function of the same species as y, we may presume that the quantity which is multiplied by j^2 to form the remainder, namely, $\frac{1}{2}\left(\frac{1}{3\,!}\right)^2\frac{d^6}{dx^6}(y)$ is of the order unity, so that the product of that quantity and j^2/y_0 is small; if it can be shown that this is probably true for y.

Three converging lines of reasoning lead to the conclusion that the quantity $\frac{1}{72}\frac{d^6\,y}{d\,x^6}$ is (not greater than) of the order unity, when x is in the neighbourhood of the point distant one modulus from the origin. *First* the proposition is true when y is identical with $y \left(\equiv \frac{1}{\sqrt{\pi}} e^{-x^2}\right)$. For

$$\frac{d^6}{dx^6} y_0 = y_0 (-120 + 720x^2 - 480x^4 + 64x^6);$$

so that when $x = 1$ $\frac{1}{y_0} \frac{d^6}{dx^6} = +184$. Which being divided by $72 = 2.\dot{5}$. Which multiplied by j², supposing that j is about ·1, is $\cdot 02\dot{5}$. (If j is as large as ·125 the product is nearly ·04.) Now y may be written $y_0 + \delta y_0$ where δ is a variation which is by hypothesis small. Accordingly $\frac{d^6y}{dx^6} = \frac{d^6}{dx^6}y_0 + \frac{d^6}{dx^6}\delta y_0$. And in our ignorance of the form of δ we have no reason to think that it is such as to make the proportion of $\frac{d^6}{dx^6}\delta y_0 : \frac{d^6 y_0}{dx_0}$ materially different from the proportion $\delta y_0 : y_0$.* Thus what has been shown for $\frac{d^6y}{dx}$ may be expected to be approximately true for $\frac{d^6y}{dx^6}$.

But, *secondly*, we are not in complete ignorance of the function designated δy_0. From trials made by Dr. Bowley and others we know that the "j curve," viz., our y_1, fits statistics of the kind which we are considering fairly well. It is natural then to assume that the sixth differential coefficient of the function which we are seeking will be of about the same order of magnitude as that of the j curve, y_1, viz., $y_0 - \frac{1}{3!} \cdot \mathrm{j} \cdot \frac{d^3}{dx^3}y_0$. The sixth differential coefficient of this expression is $\frac{d^6}{dx^6} y_0 - \frac{1}{3!} \cdot \mathrm{j} \cdot \frac{d^9}{dx^9}y_0$ (+ term involving j²). The sixth differential coefficient of y_0 has just been given. The ninth is $y_0 (-30240x + 80640x^3 - 48384x^5 + 9216x^7 - 512x^9)$.

When for x there is substituted *unity*, the quantity within the brackets becomes 10720; which multiplied by j/3!, on the supposition that j is in the neighbourhood of ·1, gives about 180, which multiplied by $\frac{1}{2}\left(\frac{1}{3!}\right)^2 \mathrm{j}^2$ makes about ·025. This contribution to the remainder is consistent with the main theorem rather than with the first argument. But the support which it may give to the former, or the discredit to the latter, is less than appears; for the reason that, though we may be justified by experience in putting $\delta y = \mathrm{j}\,\frac{1}{3}\,!\,\frac{d^3y_0}{dx^3}$, the presumption that the successive differential coefficients are equatable to the corresponding derivatives of the expression on the right becomes less and less tenable as very large numerical coefficients are introduced. For in the case of the higher differential coefficients it probably becomes unsafe to neglect terms (of the generalized law) involving the *cube* and higher powers of j.

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* On the nature of this evidence see my article on "Probability" in the Eleventh Edition of the *Encyclopædia Britannica* (vol. XXII, p. 377).

A *third* argument is based on observation of concrete frequency statistics of which the grouping appears to be in the neighbourhood of the normal type. Such groups, when sufficiently numerous, present a regularity and smoothness which strongly suggests that the function proper to represent the frequency does not vary *per saltum.* This presumption applies, I think, not only to the function itself, but also to the first and perhaps the first few differential coefficients, at least when corroborated by the observation of *differences.* When the observations are sufficiently close to afford fine differences, we may express a differential coefficient in terms of the corresponding and higher differences, and thus obtain an intimation of the order of magnitude which is to be ascribed to the differential coefficient. A good example is afforded by a set of unpublished statistics which Dr. Bowley has allowed me to see and cite. They have been obtained by tabulating the frequency with which words of different length occur at the beginning of the lines in the work of a standard English writer. Having observed the number of letters in the initial word

TABLE XIII.—Showing the frequency-distribution of figures formed by summing the number of letters in ten words taken at random.

No. of letters.	Frequency.	No. of letters.	Frequency.	No. of letters.	Frequency.	No. of letters.	Frequency.
28	1	43	30	58	22	73	3
29	3	44	24	59	29	74	5
30	2	45	36	60	21	75	–
31	2	46	34	61	21	76	2
32	6	47	49	62	18	77	3
33	6	48	54	63	19	78	2
34	10	49	47	64	10	79	2
35	5	50	44	65	17	80	1
36	11	51	33	66	12	81	1
37	4	52	66	67	11	82	2
38	20	53	41	68	3	83	1
39	18	54	37	69	7	84	–
40	24	55	29	70	11	85	–
41	31	56	49	71	5	86	–
42	31	57	41	72	3	87	1

of 10,000 lines, and forming sums of ten such numbers, Dr. Bowley finds that these sums of ten exemplify a generalized law of error, with mean = 51·45, modulus = 13·35 × 45, j = ·14137, i = ·085. I transcribe the whole set of statistics; though at present I shall only utilize those that are in the neighbourhood of the abscissa equal to one modulus.

For the purpose in hand it is legitimate, I think, to smooth these data by some recognised process, which does not take for granted the form of the representative curve, and from the difference presented by the smoothed curve to infer the magnitude of the differential coefficients. I have employed the procedure suggested by G. Darwin for the treatment of "fallible observations;[*] and have obtained a smooth curve, which is, I think, consistent with, if it does not afford a rigorous demonstration of, the proposition in question.[†]

All the preceding arguments become *a fortiori* when it is remembered that what we are concerned to prove is the comparative smallness of the sixth differential coefficient not for y, but for the less abnormal (y).[‡]

Altogether it has been rendered probable that the second approximation holds good up to the stage distant one modulus from the centre. A like proposition may be established for the third approximation by the correction involving the coefficient i. We might consider this term at first by itself, abstracting the term involving j. The remainder on this supposition becomes $i^2 \frac{1}{2} \left(\frac{1}{4}!\right)^2 \frac{d^8}{dx^8}(y)$; (y) now standing for what y becomes when for i in y there is substituted the smaller coefficient i_1. On the analogy of the *first* argument above employed, forming $\frac{d^8 y_0}{dx^8}$, I find that the remainder (of the expression which is to be multiplied by y_0 to form y) is probably of an order not exceeding $1·5\ i^2$; that is small enough. The *second* argument, based on an examination of $\frac{d^{12} y_0}{dx^{12}}$, adds about as much or as little as the corresponding argument for the second approximation.[§] The verification afforded under the *third* head is similar to, though with the statistics at my disposal even less precise than, the evidence above adduced under this head.

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[*] *Phil. Mag.*, 1877.

[†] The supposition entertained by Dr. Sheppard as to the character of the representative curve (his U) which he seeks to determine by "reduction of mean square of error" (*Journal of Institute of Actuaries*, vol. XLVIII (1914), p. 173), has a close affinity to our postulate.

[‡] Above, p. 66.

[§] Above, p. 68, para. 1.

There is no difficulty about combining the arguments which have been separately applied to the i and j developments, the remainder now comprising a term affected with i j.

With regard to the coefficients k_3, k_4, &c., of which abstraction has so far been made, it is to be presumed, on the hypothesis of numerous contributory causes, that these coefficients are affected with denominators respectively of the orders $n^{\frac{3}{2}}$, n^2, &c. (n being the number of independent elements); and on the principle of *a priori* probabilities that their numerators are not of very different orders. They may therefore probably be ignored.

Altogether it appears that the validity of the i development is established by arguments similar to, if not quite so strong as, those relating to the j development. One important difference between the two corrections of the normal curve should be noticed. However large j is, the correction is presumably small for values of x (measured from the origin) which are sufficiently small. Whereas an abnormal magnitude of the coefficient i makes itself at once felt on the initial ordinate; which is $y_0\ (1 + \frac{1}{2}\ \text{i})$.

On the whole it results that the generalized law of error is only available when the coefficients of abnormality, i and j, are small fractions; and that when it is thus available it avails for the main body of the group, a central tract comprising some 85 per cent. of the total. The extremities, including together some 15 per cent. of the total, are not adequately represented by the law unless the coefficients of abnormality are very small. But though the law is not specially adapted to represent the extremities, may it not be as well adapted as any other law? *Ceteris paribus* certainly there would be a convenience in employing a single uniform construction both for the body and the extremities. Need we proceed like the painters who sometimes employ a secondary model for the less characteristic parts of a figure? Why not do like the Duke of Wellington when one day, happening to call unusually early at the studio of the artist to whom he was sitting for his portrait, he found there a consequential personage who described himself as the gentleman who sat for the Duke of Wellington's legs. The Duke dispensed with the services of this gentleman saying that he would sit for his own legs. The generalized law of error cannot indeed pose for the extremities of the figure with the same right as the Duke of Wellington for his legs. The case is rather like that of one who as to countenance and mien was qualified to be the model for some ideal or historical figure—"subject picture" is, I believe, the proper term—while as to the extremities some other, in other respects inferior, model might possibly be preferable.

The adventitious model in our case would be the method of translation. Before considering the expediency of the suggested combination, it may be well to show its practicability. The simplest plan is to determine both constructions (whether by way of moments or otherwise) upon the supposition hitherto entertained that the integral of the ordinate between extreme limits is equal to unity; then to prefix to each of the functions so determined a coefficient which is to be determined so that the integral of each function between proper limits may be equal to the area which it purports to represent. These directions will be made clearer by an example.

The example is taken from the statistics dealt with in Tables II and III and their context, the number of trumps held by the first hand in 25,000 deals at whist.* The constants pertaining to the generalized law for this group are:—j = ·065, i = − ·0163. For translation the constants are κ = ·0436 λ = − ·01. Now put $A \frac{1}{\sqrt{\pi}} e^{-x^2} \left[1 - {\cdot}13\,(x - \frac{2}{3}x^3) - {\cdot}0163\left(\frac{1}{2} - 2x^2 + \frac{2}{3}x^4\right)\right]$ as the law for the portion of the group handled in Table II from X (number of trumps held) = 1·5 to X = 5·5 inclusive; comprising about 88 per cent. of the total area, more exactly ·8809. That is, the actual observed area. But by calculation the comprised area—is the sum of the values of v in Table II—is 8645 per cent. Accordingly equate A × ·8645 to ·8809. Whence for A is found 1·019. Likewise consider the extremities, beyond the limits indicated, to be represented by the translation $y = B \frac{1}{\sqrt{\pi}} e^{\xi^2} / a(1 \pm 2\mu\xi + 3\lambda\xi^2)$; where ξ is the function derived by inversion from the equation $x = a(\xi + \kappa\xi^2 + \lambda\xi^3)$ and a is a now familiar function of the constants κ and λ together with μ_2. Whereas the actual contents of the extremities obtained by summing the relevant values of U in Table III (viz., ·0086 + ·0689 on the left, and ·03408 + ·00744 on the right) = ·119 (of the total); the calculated area is B (·0103 + ·0711, + ·0386 + ·0083 = ·1283; put B × ·1283 = ·119. Whence B = ·9267.

To exhibit the results of this construction we ought to multiply each of the relevant values of v in Table II by 1·019, and each of the relevant values of θ in Table III by ·9267. The result is exhibited in Table XIV.

It may be objected to this construction that the ordinates of the two curves at the point of junction are not equal. This objection might be met by determining from the analytic expression of the two curves a point x such that the corresponding ordinate should be the same for both curves. But I doubt whether the result would be worth the trouble of the calculation. The point determined might prove not to be in the neighbourhood of $x = 1$ (modulus). There would still remain a discontinuity of tangent, and the inelegance of a composite type. Actuaries intent upon "graduation" would still desiderate a uniform and continuous formula.

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* *Ante*, pp. 459, 467.

TABLE XIV.—Showing the Compound Method of Generalization and Translation.

X	0·5	1·5	2·5	3·5	4·5	5·5	6·5	
U	·0086	·0689	·2105	·2976	·25484	·118	·0341	·0074
v	·0095	·0659	·2087	·2991	·2497	·1234	·0358	·0069
e	·0009	·003	·0018	·0015	·0051	·0054	·0017	·0005

$$S\frac{e^2}{U} = \cdot 02.$$

Before weighing these objections against the advantage of employing translation to represent the extremities, let us inquire whether that advantage might not be obtained by some other construction. Would the advantage be seriously diminished by using the method of translation for the body, as well as for the extremities, of the groups? The answer to this question is furnished by the following, I think, important proposition. When the generalized law of error is available, then throughout the whole tract for which it is valid the result of translation is practically equivalent to the generalized law.

This may be shown as follows :—The equation for the generalized law may be written

$$y = \frac{1}{\sqrt{\pi}c} e^{-\frac{x^2}{c^2}} \left[1 - 2\,\mathrm{j} \left(\frac{x}{c} - \frac{2}{3} \left(\frac{x}{c} \right)^3 \right) + \mathrm{i} \left(\frac{1}{2} - 2 \left(\frac{x}{c} \right)^2 + \frac{2}{3} \left(\frac{x}{c} \right)^4 \right) \right] ;$$

where x is measured from the centroid of the group, $c = \sqrt{2\mu_2}$; i and j are by hypothesis small fractions, such that their squares and higher powers (and products) may be neglected. For translation we have $y = \frac{1}{\sqrt{\pi}} e^{-\xi^2} / a\,(1 \pm 2\,\kappa\,\xi + 3\,\lambda\,\xi^2)$; where κ and λ are the coefficients of abnormality proper to translation; $a = \sqrt{2\mu_2}/(1 + \kappa^2 + 3\lambda + \frac{15}{4}\lambda^2)$; ξ is the function of x obtained by inversion from the equation $x = a\,(\xi + \kappa\,\xi^2 + \lambda\,\xi^3)$; the abscissa x is measured from the median of the group. Fixing attention on the constant κ, let us at first abstract λ. Now $\kappa = \sqrt{\chi}$, $\chi = \frac{4}{9}\beta$ + etc., the etcetera involving higher powers and products of β and ϵ; $\beta = \frac{1}{8}\beta_1$ (the Pearsonian constant β_1)

$$= \frac{1}{8}\frac{\mu^2{}_3}{\mu^3{}_2} = \left(\frac{\mu_3}{2\mu_2{}^{\frac{3}{2}}}\right)^2 = \mathrm{j}^2,\ \epsilon = \frac{1}{12}(\beta_2 - 3) = \frac{1}{3}\frac{\mu_4 - 3\mu^2{}_2}{(2\mu_2)^2} = \frac{1}{3}\mathrm{i}.$$

Thus the higher powers of β and ϵ consist of higher powers of i and j, and therefore by hypothesis may be neglected. Therefore $\chi = \frac{4}{9}\beta$ (nearly enough); $\kappa = \frac{2}{3}\mathrm{j}$. Also a (λ being omitted) $= \sqrt{2\mu_2} = c$; $\xi = \frac{x}{c} - \frac{2}{3}\mathrm{j}\left(\frac{x}{c}\right)^2$. Substituting these values in the expression for the ordinate, expanding in ascending powers of j, and neglecting powers above the first, we have

$$y = \frac{1}{\sqrt{\pi}c}e^{-\frac{x^2}{c^2}}\left[1 - \frac{4}{3}\mathrm{j}\left(\frac{x}{c} - \frac{x^3}{c^3}\right)\right];$$

which is identical with the generalized law when referred to the Median as origin. For the abscissa of the Median with respect to the centroid as origin is (to the required degree of approximation) $\frac{1}{3}\mathrm{j}c$.* Substitute then for x in the above written expression for the generalized law $\left(x - \frac{1}{3}\mathrm{j}\,c\right)$, and expand in ascending powers of j. There results the expression which was just now given for the translated curve.

Next let us introduce λ, at first abstracting κ. We have now $y = \frac{1}{\sqrt{\pi}}e^{-\xi^2}/a\,(1 + 3\lambda\xi^2)$ where $a = c/(1 + 3\lambda)^{\frac{1}{2}}$; ξ is the function of x obtained from the equation $x = a\,(\xi + \lambda\xi^3)$; x is measured

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* The difference between the area on the left of the centroid and the area on the right is equal to twice the area subtended by the abscissa of the Median. That area differs only by a quantity of the order j^3 from the product of the said abscissa and the central ordinate which $= 1\Big/\sqrt{\pi c}.$ Also the difference between the area on the left and that on the right of the centroid

$$= 4\,\mathrm{j}\int_0^\infty \frac{1}{\sqrt{\pi c}}e^{\left(\frac{x}{c}\right)^2}\left[\frac{x}{c} - \frac{2}{3}\left(\frac{x}{c}\right)^3\right] = 4\,\mathrm{j}\,\frac{1}{\sqrt{\pi}}\frac{1}{6} = \frac{2}{3}\frac{\mathrm{j}}{\sqrt{\pi}}$$

Thus if m (without respect of sign) is the required abscissa of the median, $2\,m\,/\,c\sqrt{\pi} = \frac{2}{3}\mathrm{j}\,/\sqrt{\pi}$; whence $m = \frac{1}{3}\mathrm{j}$. The proposition has been utilised by Dr. Bowley in his *Elements of Statistics* (Appendix).

from the Median, not now (in the absence of κ and therefore of asymmetry) different from the centroid. We have then $\lambda = \epsilon +$ etc., the etcetera consisting of higher powers of ϵ. Now $\epsilon = \frac{1}{3}\,\mathrm{i}$, and the powers of i above the first are by hypothesis to be neglected. Thus $\lambda = \frac{1}{3}\,\mathrm{i}$ (nearly), $a = c/(1 + \mathrm{i})^{\frac{1}{2}} = c\,(1 - \frac{1}{2}\,\mathrm{i})$ — to the required degree of approximation. $\xi = \frac{x}{a} - \lambda\frac{x^3}{a^3} = \frac{x}{c}\left(1 + \frac{1}{2}\mathrm{i}\right) - \frac{1}{3}\,\mathrm{i}\,\frac{x^3}{c^3}$

Substituting these values in the expression for y, we have

$$y = \frac{1}{\sqrt{\pi}c}\,e^{-\frac{x^2}{c^2} - \mathrm{i}\frac{x}{c^2} + \mathrm{i}\frac{2}{3}\frac{x^4}{c^4}}\left(1 + \frac{1}{2}\,\mathrm{i}\right)\left(1 - \mathrm{i}\,\frac{x^2}{c^2}\right)$$

Reducing (and neglecting terms involving powers of i above the first) we obtain

$$y = \frac{1}{\sqrt{\pi}c}\,e^{-\frac{x^2}{c^2}}\left[1 + \mathrm{i}\left(\frac{1}{2} - 2\frac{x^2}{c^2} + \frac{2}{3}\frac{x^4}{c^4}\right)\right];$$

which is identical with the generalized law of error.

The mathematical reader will have no difficulty in combining the lines of reasoning which have been traced for κ and λ separately, and proving the theorem in all its generality.

It appears therefore that in a case requiring the method of translation to represent the extremities, it does not make much difference whether we use it only for the extremities or also for the body of the group.* The generalized law in such a case might be compared to an expert or first-hand witness who guarantees by his knowledge of facts and causes the substance and main portion of his testimony. But as it often happens that an historical narrative, in order to be readable and intelligible, superadds to the scientifically ascertained facts some matter not admitting of such perfect evidence—representation of motives, for instance—so it may occur that the expert authority is not qualified to supply this supplementary matter. A literary editor had better be called in. In such a case it may be a matter of choice whether the editor should quote the

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* In the only example which I have observed a comparison between Table III (*ante* p. 467) and Table XIV shows some advantage for the compound of the two methods over the method of translation pure and simple, the mean discrepancy between the actual and the constructed area being for the compound ·02, for simple translation ·03.

This greater accuracy of the compound method, as compared with simple translation exemplified in Table III, is hardly to be counted a merit when it is considered that the compound method has at its disposal an additional constant—two constants, A and B, where the simple method has only one constant.

ipsissima verba of the first-hand authority, or weave the substance of his statement into a continuous narrative. The choice might well depend on the purpose in hand.

Of course, it must first be settled whether it is necessary to call in external aid. This question in our case, can only be settled, I think, by frequent actual trials. A specimen of such a trial is adjoined in Table XV. I extend the calculation exhibited in Table II to the extremities there left untouched.* For explanation of the details the reader is referred to the context of that table.

TABLE XV.—In continuation of Table II.

X		0·5		1·5	5·5		6·5	
x		−2·7494		−1·7494	+2·2506		3·2506	
ξ		1·508		·9596	−1·2346		1·783	
Θ		·4836		·4126	·4593		·4942	
θ	*·0164*		*·071*			*·035*		·0058
η		·0566		·2246	·1228		·023	
ξ^2		2·274		·9207	1·524		3·179	
Φ		·255		·2511	·2719		·229	
ϕ	− ·067		·0039			− ·0429		− ·041
$\pm$ j ϕ	− ·0044		·0002			+ ·0028		+ ·0027
ξ^3		−3·4293		− ·8836	1·882		5·668	
i Ψ		+ ·00036		− ·007	+ ·0002		·0004	
i ψ	− ·00036		·001			·0002		− ·0004
$\pm$ j ϕ + i ψ	− ·0048		+ ·0013			+ ·003		+ ·002
v	·0116		·0723			·038		·0078
U	·0086		·06896			·0341		·0074
e	·003		·0034			·004		·0004

X denotes numbers of trumps (in the first hand at whist).

$x = \mathrm{X} - 3{\cdot}2494.$

$\xi = x \div 1{\cdot}8228.$

$\Phi = \frac{1}{3}\,({\cdot}56419 - \eta + 2\xi^2\eta).$

ϕ is the difference (in absolute quantity) between the values of Φ at the two boundaries of any compartment.

The extreme entries for ϕ and ψ are found by subtracting the penultimate value of Φ from its value at infinity, namely, $\frac{1}{3}{\cdot}56419$, and likewise the penultimate value of Ψ from its value at infinity, that is, zero.

j = ·065. j ϕ is positive for compartments below the central one, and negative for compartments above the central.

i = − ·0163. $\mathrm{i}\,\Psi = -\,{\cdot}0163\left(\frac{1}{2}\xi - \frac{1}{3}\xi^3\right)\eta$; ξ (and ξ^3) being taken in absolute quantity.

i ψ is formed by taking differences between successive values of i Ψ.

$v = \theta \pm \mathrm{j}\,\phi + \mathrm{i}\,\psi.$

U is the content of each compartment (given *ante* p. 458).

$\mathrm{e} = v - \mathrm{U}.$

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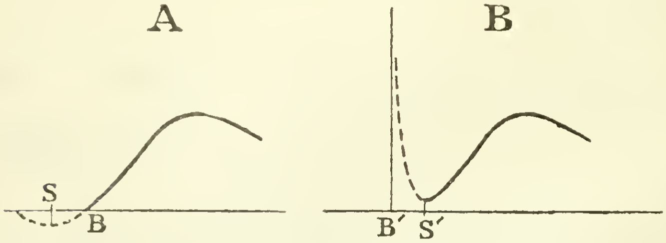
* *Ante* p. 461.

Comparing these results with the original, and likewise those which have been obtained by translation (including the kind compounded with the generalized law), I am disposed to prefer the latter. But many more trials would be necessary in order to establish a secure induction.

I have made several trials not of the decisive character which has just been described, but rather forming preliminary enquiries as to the qualification of each rival to enter as a candidate for the honour of representing the outlying portions of a group. An examination of this kind is effected by the application of the tests which I have applied in a former paper to the method of translation.* They consist, it will be remembered, of the condition that within the cases with which we are concerned there should not occur a discontinuity or fault of the kinds which we have designated "break" and "stop." A "break" occurs when the ordinate representative of frequency becomes either negative or infinite. A "stop" occurs where the ordinate has a minimum value. In the (subnormal) class of curves which we are now considering a break usually occurs sooner (as you move away from the origin) than a stop, in the case of the generalized law; in the case of translation, a stop before a break. Figure I A illustrates (with reference to the lower limb of the group) the typical limit (a term which we use generally) for the generalized law, B the break nearer the origin than S, the stop; Figure I B illustrates the typical limit for translation, S′ the stop nearer the origin than B′. The curve beyond the limit in each case is drawn faintly, with a broken line, as being comparatively insignificant for the purpose of representation (of unimodal groups).

Figure I.



I give the results of applying these tests to a set of examples formed by putting j either 0 or $\cdot 1$, with i either 0, $+\cdot 1$ or $-\cdot 1$.[*] Of the *five* cases thus presented (the combination 0, 0 pertaining to a normal curve does not concern us) two have no limit for either generalized law or translation; that is, the case in which i $= \cdot 1$, j $= 0$, and the case in which i $= \cdot 1$, j $= \cdot 1$. In the first case the equation for the stop of the generalized law is (alike above and below the origin) $1 + \cdot 1\left(\frac{1}{2} - 2x^2 + \frac{2}{3}x^4\right) = 0$; an equation which has evidently no real root. Likewise the equation for the stop of the translated curve is $3\lambda x^2 + (1 + 3\lambda) = 0$[†]; which also has no real root. A similar statement is true, though less obvious, in the case when i $= \cdot 1$, j $= \cdot 1$. For the break of the generalized law *above* the origin we have now

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* *J.R.S.S.*, vol. LXXVII (1914), pp. 309, 663, *et passim.*

$$1 - \cdot 1 \times 2\left(x - \frac{2}{3}x^3\right) + \cdot 1\left(\frac{1}{2} - 2x^2 + \frac{2}{3}x^4\right) = 0.$$

Reducing we have

$$x^4 + \frac{4}{3}x^3 - 2x^2 - \frac{8}{3}x + 10\cdot 5 = 0.$$

If the limiting equation is formed, and the point at which the original function is a minimum ascertained and observed, it will be seen that the expression on the left never becomes zero for any positive value of x. The like is more simply evident in the case of translation for which the equation for the stop is

$$3\lambda x^3 + 2\kappa x^2 + (1 + 3\lambda)x + \kappa = 0.$$

To establish that this equation has no positive root it suffices to show that λ is positive, which follows from the equation

$\lambda = \epsilon - \frac{8}{9}\beta$; $\epsilon = \frac{1}{3}$i, that is, $\cdot 0\dot{3}$, and $\beta = \text{j}^2 = \cdot 01$; whence $\lambda = \cdot 02\dot{4}$.

On the *left* of the origin for the generalized law we have to find the abscissa (in absolute quantity) of the break the equation $x^4 - \frac{4}{3}x^3 - 2x^2 + \frac{8}{3}x + 10\cdot 5 = 0$; which by parity of reasoning with that above employed is found to have no positive root. The equation for the critical points of the translated curve (including the mode as well as the stop) is

$3\lambda x^3 - 2\kappa x^2 + (1 + 3\lambda)x - \kappa = 0$, where $\lambda = \cdot 02\dot{4}$, $\kappa = \frac{2}{3}\cdot 1 = \cdot 0\dot{6}$.

We have thus $\cdot 07\dot{3}x^3 - \cdot 1\dot{3}x^2 + 1\cdot 07\dot{3}x - \cdot 0\dot{6} = 0$. This equation has one root, the mode, at a short distance on the left from the

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[*] As to the reason why j does not, like i, receive *three* values, see above, p. 65.

[†] *Cf. J.R.S.S.*, vol. LXXVII (1914), p. 420 *et seq.* It is not necessary in the present context to use the Greek symbol ξ.

Median. Beyond that point there is no root; since the expression $x\,(\cdot 07\dot{3}\,x^2 - \cdot 1\dot{3}\,x + 1\cdot 07\dot{3})$ remains positive for all positive values of x. When $i = 0$ $j = \cdot 1$ we have for the break of the generalized law in the *upper* branch

$$1 - \cdot 2\left(x - \frac{2}{3}x^3\right) = 0;\ \text{or}\ x^3 - \frac{3}{2}x + 7\cdot 5 = 0,$$

an equation which has no positive real root. For the *lower* branch the equation is $x^3 - \frac{3}{2}x - 7\cdot 5 = 0$; an equation which has a positive root about 2.2. For translation we have the constant

$$\kappa = \cdot 0\dot{6}\ \text{and}\ \lambda = -\frac{8}{9}\beta = -\frac{8}{9}\cdot 01 = -\cdot 00\dot{8}.$$

Accordingly for the stop *above* the origin we have the equation

$$-\cdot 02\dot{6}x^3 + \cdot 1\dot{3}x^2 + \cdot 97\dot{3}x + \cdot 0\dot{6} = 0,$$

of which in the positive root is nearly 9! For the *lower* branch the equation is $\cdot 02\dot{6}\,x^3 + \cdot 1\dot{3}\,x^2 - \cdot 97\dot{3}\,x + \cdot 0\dot{6}$; which has one positive root in the neighbourhood of the origin, namely, the mode, and another positive root, the stop, at an immense distance from the origin, viz., 4, leaving out of account about a hundred millionth of the total area!

These results are recorded in Table XVI; together with the similarly ascertained results for the two remaining cases

$$i = -\cdot 1,\ j = 0;\ i = -\cdot 1,\ j = \cdot 1.$$

TABLE XVI.—Showing limits of the generalized and translated error-curve.

Coefficients.		Lower branch.		Upper branch.	
i	j	Generalized law.	Translation.	Generalized law.	Translation.
·1	0	none	none	none	none
·1	·1	none	none	none	none
·0	·1	2 ·2	4 nearly	none	9 nearly
− ·1	0	2 ·36	3	2 36	3
− ·1	·1	2 ·06	2 ·2 nearly	3 ·12	3 ·21

TABLE XVII.—Showing the area bounded by the normal error-curve beyond certain values of the modulus.

Modulus.	Area beyond.	Modulus.	Area beyond.
1 ·75	·00667	2 ·5	·00012
2	·00234	3	·000011
2 ·25	·00073	4	·000000008

As I have here and elsewhere often to refer to the small extent of the area bounded by the normal curve which lies beyond large values of the modulus, it may be convenient to the reader that I should add a short table reminding him of the orders of magnitude in question.

In these and other cases I find no material difference between the rival candidates in respect of their availability to act as representatives. But it must be observed that the tests which have been applied form rather a necessary than a sufficient condition. It is necessary that there should be sufficient canvass to represent in its entirety an outstretched limb. But the fulfilment of this condition is not a security against a misrepresentation of the limb, the depiction of an extremity which does not exist in the original. That is the defect—or rather excess—which Mr. Palin Elderton complains of in one of my examples of the generalized law.* The complaint is quite just when the law is considered—as here—in its application to the entire group, and not—as there—with reference to the central part only.

Abnormal cases.—On the threshold of this division may be placed the example which has just been mentioned. Or perhaps it lies on the dividing line between the classes. For, on the one hand, the generalized law is adequately fulfilled by the central part, as shown in a former paper.† But on the other hand, at the lower extremity, the generalized law fails, as pointed out by Mr. Palin Elderton, and the method of translation fails, as pointed out by myself.‡ The latter failure, however, seems less serious than the former. This may be shown by a summary application of the method of translation to the example in question; which I reproduce in Table XVIII.§

From the data given by Professor Pearson we have

$$\beta\left(=\frac{1}{8}\beta_1\right) = \cdot 0663;\ \xi = \frac{1}{12}(\beta_2 - 3) = \cdot 0208$$

With these constants are formed the simultaneous equations for the coefficients of translation χ (κ^2) and λ. I find it troublesome (in the absence of an appropriate table) to determine these coefficients very exactly. An approximation sufficiently near for the present purpose, I think, is afforded by the system $\chi = \cdot 0355$ ($\kappa = \cdot 1884$) $\lambda = -\cdot 045$.

Whence $a = \sqrt{2\mu_2} \Big/ \sqrt{1 + \chi + 3\lambda + \frac{15}{4}\lambda^2} = \sqrt{17\cdot 14552/\cdot 9081}$

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* *Ante* p. 462.

† *J.R.S.S.*, Vol. LXIX (1906), p. 522 *et seq.*

‡ *J.R.S.S.*, vol. LXXVII (1914), pp. 663, 664; where the stop is put too far from the origin owing to the roughness of the approximation for the constant λ (p. 662).

§ From Pearson's *Chances of Death*, vol. I, p. 74.

(μ_2 being given $= 8·57276$) $= 4·345$. The mean being (given) at 4·228, the constructive median* is on the left of that point at a distance $a \times \frac{1}{2}\kappa = 4·345 \times ·0942 = ·4093$. Whence the constructive median* is 3·82 nearly.

TABLE XVIII.—Showing the frequency of families of different sizes.

Size of family.	Frequency per cent.	Size of family.	Frequency per cent.	Size of family.	Frequency per cent.
0	6·397	6	8·166	12	1·002 ?
1	11·642	7	7·164	13	·469
2	13·966	8	4·861	14	·171
3	14·542	9	3·667	15	·043
4	13·390	10	2·516	16	·021
5	10·576	11	1·343	17	·043

The curve defined by this construction seems to fit the given statistics fairly well. Here are some tests.

(*a*) Let us observe the point corresponding to ξ (the abscissa of the generating curve with unit modulus) $= +2$, the point which (according to the table of the probability-integral) ought to have 234 out of 100,000 observations beyond the point on its right. The corresponding value of x the distance (on the abscissa of observations) from the constructive median is

$a(\xi + \kappa\xi^2 + \lambda\xi^3) = 4·345\,(2 + 4·1884 - 8 \times ·045) = 10·4\,m.$

Whence for the abscissa measured from zero (the number of children in a family) there results $10·4 + 3·82 = 14·2$. Whereas the point above which there actually occurs ·00234 of the total group is found by observation (with the use of proportional parts) to be 13·4.

(*b*) Again, let us compare the number of observations above 16 (measured from zero); or rather, as I read the statistics, above the point 16·5; that is, at a distance above the constructive median, $16·5 - 3·82 = 12·68$. This distance divided by a $(= 4·345) = 2·9183$. Whence for ξ the corresponding ordinate on the generating curve I find by solving the relevant cubic equation, 2·43. According to this calculation the remainder is ·0003 of the total group, or, expressed by way of percentage, ·03 out of a group numbering 100. The corresponding proportion shown by the actual statistics is ·04.

(*c*) Not to weary the reader with the detail of some other equally satisfactory soundings nearer the centre, I will adduce only one more verification, one with which we are particularly concerned—at the lower extremity. As I read, the number of families which have *no* children are to be conceived as extending between the point $+ 0{\cdot}5$ and $- 0{\cdot}5$; or at least as below the point $+ 0{\cdot}5$. Thus, according to the actual statistics, the percentage of observations below $+ 0{\cdot}5$ is 6·397. What is the percentage found by our calculation? Since $3{\cdot}82 - 0{\cdot}5 = 3{\cdot}32$, we have $x = 3{\cdot}32$; $x/a = 3{\cdot}32/4{\cdot}345 = {\cdot}764$; and as the cubic equation for $\xi - {\cdot}045\ \xi^3 - {\cdot}1884\ \xi^2 + \xi = {\cdot}764$, of which I find the root to be ·9946. The remainder beyond this is found (from Burgess's Table) at 8 per cent., which agrees fairly well with the original (6·4 per cent. nearly).

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* See *ante* p. 466.

Let us trace the curve beyond the point 0·5. There is a "stop"* at the point corresponding to one of the values of ξ which is given by the cubic equation

$$- 3 \times {\cdot}045\xi^3 - 2 \times {\cdot}1884\xi^2 + (1 - 3 \times {\cdot}045)\xi - {\cdot}1884.$$

The first root we meet with, moving leftward from the Median, corresponds to the *mode*. The second root gives the "stop" It is found by me to be 1·306. Thus x (the distance from the Median) $= 4{\cdot}345\ (1{\cdot}306 - {\cdot}1884 \times 1{\cdot}306^2 - {\cdot}045 \times 1{\cdot}306^3) = 3{\cdot}84$. The stop occurs at the point $3{\cdot}82 - 3{\cdot}84$, just below zero. For the "break"† we have the quadratic equation

$$1 - 2 \times {\cdot}1884\xi - 3 \times {\cdot}045\xi^2 = 0.$$

Whence $\xi = 1{\cdot}67$; $x = 4{\cdot}15$. The break is at the point ·33 below zero; within the outmost compartment according to our construction. The tail beyond the break curls round and stretches backward towards the Median. But it does not reach far enough to derange the construction seriously. This may be shown by observing how far the reverted tail has reached when $\xi = 2$; at which stage its influence may be considered extinct. We have for the distance from the Median $x = 4{\cdot}345\ (2 - 4 \times {\cdot}1884 - {\cdot}045 \times {\cdot}8) = 3{\cdot}85$; that is, just left of the stop. The proportion left unrepresented as both lying beyond the stop, and deranged by the turn-up, is between 3 and 4 per cent. of the total. With regard to that outlying portion the construction adds nothing to the facts: it tells us that the said percentage occurs in the final compartment; but it does not, as elsewhere, superadd a hypothetical representative permitting "graduation"; whereas the generalized law of error presents a graduated extremity which has no existence in fact. This representation gives no indication, as the method of translation does, of the point after which it is no longer to be taken seriously.*

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* Above, p. 76.

† *Cp. J.R.S.S.*, Vol. LXXVII (1914), p. 420.

As we move away—in some directions at least—from the normal type the superiority of the method of translation becomes more marked. A typical comparison is afforded by the statistics of ages at marriage adduced by Professor Pearson to illustrate his fifth and sixth very abnormal types.† The mean age of the brides is 22·1877 ; and the numbers married at subsequent ages form a descending series stretching beyond the age of 40. The Pearsonian coefficient $\beta_1 = 1\cdot 9396$; $\eta = \beta_2 - 3 = 3\cdot 8873$. Whence $\mathrm{j}^2 = \frac{1}{8}\beta_1 = \cdot 24245$, $\mathrm{j} = \cdot 4923$. Also $\mathrm{i} = \frac{1}{4}\eta = \cdot 932$. Accordingly for the break on the upper limb of the curve as constructed by the generalized law we have $1 - \cdot 4923 \times 2\,(x - \frac{2}{3}x^3) + \cdot 932\left(\frac{1}{2} - 2\,x^2 + \frac{2}{3}\right)x^4) = 0$; which reduced becomes $\cdot 621\dot{3}\,x^4 + \cdot 6564\,x^3 - 1\cdot 864\,x^2 - \cdot 9846\,x + 1\cdot 466$. The first, the smaller, positive root of this equation is about ·85, which. as the modulus $\sqrt{2\mu_2}$ is about 5·1, corresponds to a point distant from the mean by about 4·33 ; that is, the age 26·5. There is thus cut off and left out of account a limb containing about a tenth of the total contents and covering more than half the entire range of the original figure. The construction is a complete failure. Whereas the method of translation reproduces the original statistics with remarkable fidelity. This will be shown in a later section when comparison is made with the Pearsonian types. Let it suffice at present to say, by anticipation, that in contrast to the generalized law, the curve constructed by translation like the original presents a small permilleage beyond the age of 40 ; and that whereas on the lower side the original histogram stops at 15, the constructed curve has only a very small permilleage below that point.

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* These severe remarks upon the generalized law as applied to the extremity are quite consistent with the pre-eminence within its proper sphere which I have claimed for it in a former passage (*ante* p. 464). I there observe, "the existence "of such a fictitious tail in the representative form proves only that, corresponding "to the excess at the extremity, there must be defect *somewhere* in the body of "the curve." I might have added not only that the defect *may* not, but also that it *does* not, in that case affect the central portion of the group. For the excess formed by the projecting tail is compensated *within the final compartment* which lies left of the point 0·5. The area left of that point shown in the representation is practically the same as what it is in the original (*Cf. J.R.S.S.*, vol. LXIX, 1906, *Law of Great Numbers*, Appendix, Table III).

† *Transactions of the Royal Society*, 1901, A., p. 451.

It is to be added in favour of translation—*valeat quantum*—that when still receding from the central type we pass to curves that are no longer unimodal, then the method of translation is of some avail, but the generalized law of none at all.

Possibly there may exist classes of phenomena for which the generalized law has the advantage, but provisionally I think the following conclusion may be formed.

Conclusion.—In the neighbourhood of the normal type either the generalized law or translation, or a cross between them, may be employed with apparently equal advantage. The choice probably depends upon the purpose in hand. As we recede from the normal type the method of translation becomes preferable. If a single uniform method appropriate to general purposes is required, that method is translation rather than generalization.

(*To be continued.*)

ASCERTAINMENT OF MEAN POPULATION FROM CENSUS RETURNS.

BY A. J. TRAVERSI, A.I.A.

Waters' formula.

1. In arriving at the mean population for an inter-census or related period on the assumption of geometrical progression, we are met with the difficulty that the results obtained for the separate age groups do not add to agree with that obtained from the population as a whole. In order to overcome this difficulty a formula was devised by Mr. A. C. Waters and published in the *Journal of the Royal Statistical Society*, Vol. LXIV, page 293. The formula has been adopted by Mr. George King, F.I.A. (*See* Vol. LXII *Journal of the Institute of Actuaries*, page 263.)

The formula proceeds upon the hypothesis that whilst the total population increases in geometrical progression, the population at any particular age group is related to the total population by a proportion increasing in arithmetical progression.

2. At a glance, it is not perhaps quite evident what the practical effect of the formula is, but it can be shown that it will under certain circumstances give results at individual age groups *exceeding the arithmetical mean.* Omitting the correction for a fractional period, the formula may be stated thus :

$$\text{Mean population} = \frac{\pi_1}{\lambda r}\left(\frac{r-1}{\lambda r} - 1\right) + \frac{\pi_2}{\lambda r}\left(1 - \frac{r-1}{r\lambda r}\right) \qquad \text{A}$$

where π_1 and π_2 represent the population at a given age group at beginning and end of a period, and r = ratio of increase of the whole population.

3. If we put $r = (1 + i)$ we may expand the above expression by simple division, remembering that $\lambda_e (1 + i) = i - \frac{i^2}{2} + \frac{i^3}{3} - \ldots$ &c., whence we get

$$\text{Mean population} = \pi_1\left(\frac{1}{2} + \frac{i}{6} - \frac{i^2}{24} + \frac{i^3}{45} - \frac{7i^4}{480} + \ \right)$$
$$+ \pi_2\left(\frac{1}{2} - \frac{i}{6} + \frac{i^2}{8} - \frac{19i^3}{180} + \frac{3i^4}{32} - \ \right) \qquad \text{B}$$

It can readily be proved from either A or B that if instead of r (or $1 + i$) we use r' or $1 + i'$, as got from the group itself, so that $\pi_2 = \pi_1 r'$ (or $\pi_1 \ (1 + i')$), this formula will give the mean on the basis of true geometrical progression, viz. :—

$$\pi_1 \frac{r'-1}{\lambda r'} \text{ or } \pi_1\left(1 + \frac{i'}{2} - \frac{i^{2'}}{12} + \frac{i^{3'}}{24} - \frac{19i^{4'}}{720} + \ \ldots\right) \qquad \text{C}$$

Examination of the effect of Waters' formula.

4. Now, on the basis of arithmetical progression the mean population would be $\frac{1}{2}(\pi_1 + \pi_2)$. It can easily be seen from an inspection of formula B that in the case where $\pi_1 = \pi_2$ Waters' formula will give a value *greater than the arithmetical mean*, if r (got from the population as a whole) has any positive value greater than 1, as it generally has; because in that case the two parts of formula B will add together to give more than $\frac{1}{2}(\pi_1 + \pi_2)$. In other words, if $r' = 1$ and r is greater than 1, the formula will give a result greater than either that got from G.P. or A.P. falling gradually to G.P. as r' is increased to r, but remaining for some time above the A.P. Without going into other cases, it is evident then that in some instances the formula will give a result exceeding that got from arithmetical progression, which is, of course, against all canons.

It may incidentally be mentioned that if we write $\frac{i}{i'} = a$, so that $\pi_2 = \pi_1\left(1 + \frac{i}{a}\right)$ it can be deduced from B that the result got from Waters' formula exceeds that got from A.P. by

$$\pi_1\left\{\frac{i^2}{12}\left(1 - \frac{2}{a}\right) - \frac{i^3}{24}\left(2 - \frac{3}{a}\right) + \frac{19i^4}{720}\left(3 - \frac{4}{a}\right) - \ . \ . \ .\right\},$$

which from various considerations would appear to be negative if a is less than 2, and generally positive where a exceeds 2 (speaking of ordinary cases).

Proposed new method.

5. The following is suggested as a more correct procedure than that of Waters. Remembering that the assumption of arithmetical progression would give $\pi_1\left(1 + \frac{i'}{2}\right)$, it is seen by comparing this with that got from G.P. (formula C) that at each age group the latter is less by the quantity $\pi_1\left(\frac{i^{2\prime}}{12} - \frac{i^{3\prime}}{24} + \frac{19i^{4\prime}}{720} - \ . \ . \ .\right)$ or approximately $\pi_1 \frac{i^{2\prime}}{12}$. It is suggested that the calculation be first made for the population as a whole, and for each group on the basis of A.P., and then scaled down as follows:—

a. Ascertain the difference between the results from A.P. and G.P. for the population as a whole, *i.e.*, $P_1 \frac{1 + r}{2} - P_1 \frac{r - 1}{\lambda r}$.

b. Ascertain the value of $i'^2 \times \pi_1$ or $\left\{\pi_1 \times \left(\frac{\pi_2}{\pi_1} - 1\right)^2\right\}$ for each age group.

c. Divide up (*a*) in proportion to (*b*).

d. Deduct the result from the arithmetical mean of each age group.

That is to say, the scaling down is virtually done in proportion to the approximate difference between the A.M. and G.M. at each age group. It is simply a process of bracing up the inconsistent G.P. to the staunch and reliable A.P., so that, while still essentially true to itself, it partakes of that it clings to.

6. It is evident that since the G.M. is lower than the A.M., the true G.M's for the groups, being derived from ratios on each side of the value of r, and being affected proportionally much more by the higher ones, will tend to have a bias on the low side, so that though the separate A.M's add up to the A.M. for the total population, the G.M's come to *less* than the G.M. for the total, which is not affected by the bias mentioned. The proposed plan, since it leaves unchanged the case where the ratio $r' = 1$, tends to correct the bias in the groups with the higher values of r' and thus to come between the G.M. and the A.M. throughout, as it should, and, of course, it equals them when they are equal to one another.

7. Possibly some minds would be better satisfied by taking in more terms, say $i^2 (2 - i) \pi_1$ instead of $i^2 \times \pi_1$; whilst others would prefer the less scientific quantity $i \pi_1$ ($= \pi_2 - \pi_1$) on account of its greater simplicity. The latter method would be open to the theoretical objection that it would be liable to give a result falling below the true G.M. at some individual age. My investigations show that the process I have set out gives very satisfactory results with reasonable facility.

8. The following schedule illustrates how the various processes work out in a particular case :—

π_1	π_2	i'	a	A.P.	G.P.	Waters'.	Proposed Method.
250,000	320,000	·28	·5	285.000	283,561	283,878	284,043
210,000	224,000	$\cdot 0\dot{6}\dot{6}$	2 ·1	217,000	216,925	217,005	216,955
240,000	240,000	·00	∞ ($i'a = \cdot 14$)	240,000	240,000	240,343	240,000
100,000	114,000	·14	1 ·0	107,000	106,847	106,847	106,904
200,000	242,000	·21	$\cdot\dot{6}\dot{6}$	221,000	220,333	220,398	220,569
1,000,000	1,140,000	·14		1,070,000	1,067,666	1,068,471	1,068,471

G.P. for total = 1,068,471.

Further remarks.

9. The foregoing refers to the case where the progression at every age group is in the same direction. Some light is thrown on the question of mixed progressions (*i.e.*, where i' and a are positive at some groups and negative at others) by consideration of the

extreme case in which the increases at some ages are exactly counterbalanced by the decreases at other ages. The formulas based upon the rate of increase of the whole population would fail in this case. This as well as other circumstances suggest that the logical course would be to regard the movement of the population as a whole as consisting of two separate progressions in different directions, each to be dealt with separately.

10. It may be added that another method could be suggested which employs true geometrical means and yet gives results adding correctly to the G.M. of the total. This process would consist in calculating the G.M. for the population *at and over* age x, $x + 5$, $x + 10$, &c., and differencing the results.

An investigation of this method, however, shows that, apart from its want of facility, the results at individual age groups are too strongly affected by the rates of progression of neighbouring groups.

11. The following formulas may be convenient for reference: let n represent the number of years (integral or fractional) separating two censuses, and let it be desired to get the years of life lived in a related period of m years ending December 31, π_1 and π_2, the population at particular age groups at the respective census

P_1, P_2 the total population at respective censuses.

b the fraction of a year it is desired to discount or backdate the result of first census.

c the fraction of a year it is desired to discount or backdate the result of second census.

$r = \frac{P_2}{P_1}$.

$n =$ the inter-census period (years), which will generally be *about* five or ten years.

$m = n—(c\text{-}b)$, which will generally be either five or ten years, *exactly*.

$K =$ modulus.

Then years of life (geometrical progression) =

$$n\int_{-\frac{b}{n}}^{\frac{n-c}{n}} P_1\, r^t\, dt = nP_1\, K\, \frac{r^{\frac{n-c}{n}} - r^{-\frac{b}{n}}}{\log_{10} r}$$

The integral, it is to be noted, is multiplied by n, not by m; because the integral gives the number of units in the period m, and as each unit consists of n years, we multiply by n to get the number of years. The ratio r is taken for one unit n (*i.e.*, the actual intercensus period).

If $b = c$, this becomes $nP_1\, K\, \frac{r^{-\frac{c}{n}}(r - 1)}{\log_{10} r}$

The years of life (arithmetical progression)

$$= P_1\left\{\frac{m}{2}\left(1 + \frac{b+c}{n}\right)\right\} + P_2\left\{\frac{m}{2}\left(1 - \frac{b+c}{n}\right)\right\}$$

$= P_1$ first factor $+ P_2$ second factor.

If $b = c$, this becomes $P_1\left\{\frac{m}{2}\left(1 + \frac{2c}{n}\right)\right\} + P_2\left\{\frac{m}{2}\left(1 - \frac{2c}{n}\right)\right\}$

These two factors are, of course, constant and can be used at every age group to ascertain the years of life on the basis of A.P.

NOTE ON THE ABOVE.

By a Correspondent.

The problem of the determination of mean populations for several sections of a community whose sum shall equal the mean population for the whole community is a difficult one, and Mr. Traversi's contribution to the subject is very interesting. The application of the formula involves less labour than the method of calculating a mean for each section on the assumption that it has changed at a geometrical rate, and then adjusting these estimates proportionally so that their sum shall equal the estimate of the total population made on the same assumption. Further the method described by Mr. Traversi avoids the anomaly of the estimated mean exceeding the arithmetical mean, as happens in the case of Mr. Waters's formula when $\pi_1 = \pi_2$, because the sum of the two factors exceeds unity. This fact was not alluded to by Mr. Waters in his paper in the *Journal*, but even if he did not recognize it at the time he prepared the paper he did so later and referred to it in the Registrar-General's Annual Report for 1907 (p. cxxxii). It was there shown that the excess is too small to be of any practical importance, and that the method would show a mean population of 10,008 for a district with an enumerated population of 10,000 at each of two censuses ten years apart in a country with a decennial increase of 10·25 per cent. It was admitted that a supposition which involves even such slight anomalies is not theoretically sound. Mr. Waters there gave a second formula (to which Mr. Traversi does not refer) viz.:—

Mean population $= \left(\frac{r}{r-1} - \frac{1}{\lambda r}\right)\pi_1 + \left(\frac{1}{\lambda r} - \frac{1}{r-1}\right)\pi_2$, where r is the intercensal rate of increase for the whole country, λr the hyperbolic logarithm of r, and π_1 and π_2 the first and second enumerations of any section of the population.

It will be seen that this formula gives the true mean total population on the assumption of geometrical increase, viz., $\frac{r-1}{\lambda r}$ (in unit population) and that the sum of the two coefficients is unity. When π_1 equals π_2 the mean population estimated by the formula is therefore equal to the arithmetical mean.

The formula may be put into a simpler form for application by writing $\pi_1 + I$ for π_2.

Thus the mean population is

$$\left(\frac{r}{r-1}-\frac{1}{\lambda r}\right)\pi_1+\left(\frac{1}{\lambda r}-\frac{1}{r-1}\right)\left(\pi_1+I\right),$$

or since the sum of the two factors is unity, $\pi_1+\left(\frac{1}{\lambda r}-\frac{1}{r-1}\right)I$. If a section of a population show a decrease (*i.e.*, if I be negative) and $\frac{1}{\lambda r}-\frac{1}{r-1}$ be less than one half, the mean population given by the formula will exceed the arithmetical mean. It is not clear whether Mr. Waters was aware of this or not.

In the example given by Mr. Traversi, $r = 1{\cdot}14$ and $\frac{1}{\lambda r}-\frac{1}{r-1} = {\cdot}4890776$, so that if his total population included a section which declined from 10,000 to 9,000, the mean population estimated by Mr. Waters's second formula would be 9,511, or 11 more than the arithmetical mean. From a practical point of view this difference is of small significance.

And here it may be stated that Mr. Waters's formulæ were designed in the main to meet the requirements of the Registrar-General's Decennial Supplement, for which estimates of mean population were required for more than 20,000 sections of the population of England and Wales. The question of the ease of application of the formulæ was therefore one of considerable importance. After the enumerated populations have been copied out in suitable form and the factors determined, the application of the first formula involves two multiplication sums and the addition of the two products. In the application of the second formula it is necessary to determine only one factor, which has to be applied to the difference between the two enumerated populations: the addition of the product to the population enumerated at the first census gives the mean population required.

The following statement shows the application of Mr. Waters's second formula to Mr. Traversi's population figures

$$\left(\frac{1}{\lambda r}-\frac{1}{r-1} = {\cdot}4890776\right):—$$

π_1	π_2	Δ*	$0{\cdot}4890776\Delta$	$\pi_1 + 0{\cdot}4890776\Delta$
250,000	320,000	70,000	34,236	284,236
210,000	224,000	14,000	6,847	216,847
240,000	240,000	–	–	240,000
100,000	114,000	14,000	6,847	106,847
200,000	242,000	42,000	20,541	220,541
1,000,000	1,140,000	140,000	68,471	1,068,471

* $\Delta = \pi_2 - \pi_1$.

The application of Mr. Traversi's formula is as follows :—

π_1	π_2	i' $\left(=\frac{\pi_2}{\pi_1} - 1\right)$	i'^2	$\pi_1 \times i'^2$ (*b*)	(*b*) × ·04883* (*c*)	AP	AP − (*b*) × ·536
250,000	320,000	·28	·0784	19,600	957	285,000	284,043
210,000	224,000	·0$\dot{6}$	·00$\dot{4}$	933	45	217,000	216,955
240,000	240,000	·0	·0	0	0	240,000	240,000
100,000	114,000	·14	·0196	1,960	96	107,000	106,904
200,000	242,000	·21	·0441	8,820	431	221,000	220,569
1,000,000	1,140,000	·14		31,313	1,529		

* $\cdot 04883 = \frac{b}{a} = \frac{1529}{31313}$

The estimates obtained by the two methods agree very nearly, and one cannot say which set of estimates is the more accurate.

From the point of view of the amount of labour involved in the application of either of Mr. Waters's formulæ and Mr. Traversi's formula, the advantage rests with Mr. Waters's, and especially with the second one. His formulæ, too, show another advantage. For, if by them estimates have been made of the mean population of certain sections of a community, any one of those sections can be sub-divided, and the estimates for these sub-sections of the population will be consistent with the previous estimates for the entire section, and also with these for the other sections originally chosen, so that one is free to start a set of calculations knowing that in whatever way it may be necessary to sub-divide the total population subsequently, all future estimates will be consistent with these first made. This is not so with Mr. Traversi's formula. Thus, the fourth section of his population (100,000 increasing to 114,000) might consist of two parts of 50,000 each, of which one remained constant and the other rose to 64,000. For the first sub-section $\pi_1 \times i'^2$ would be zero, for the second part 3,920; and (*b*) for the whole population, so further sub-divided, would be 33,273, instead of 31,313 as given in the example above. This single sub-division of one of the original sections would thus necessitate an alteration of the factor for distributing (*a*) in proportion to (*b*), and consequently of the original estimates of the mean population for the five sections of the total population. With this further sub-division the estimates would be :—

	284,099
	216,957
	240,000
	50,000
	56,820
	220,595
Total	1,068,471

and the total for the fourth section would be 106,820, or 84 less than the estimate for the group as a whole, but only 27 different from the estimate by Mr. Waters's second method.

This is a serious limitation to the usefulness of the formula in practical application.

From the remarks which precede it would appear that Mr. Traversi's suggestion that " the movement of the population as a " whole might be regarded as consisting of two separate progressions " in different directions each to be dealt with separately " might give rise to a good deal of inconvenience in practical application if it were found to be necessary to subdivide any sections of the total population after estimates of mean population for these sections had been made.

The suggestion in paragraph 10 is an interesting one, and it is regretted that Mr. Traversi has not stated the results of his investigation. The idea embodied therein appears to be susceptible of further development.

OBITUARY.

Sir Richard Biddulph Martin, Bart.

The death of Sir Richard Biddulph Martin, Bart., on August 23, 1916, has deprived the Royal Statistical Society of one of its most valued members. Sir Richard was well known as a prominent representative of British Banking; he was one of the founders of the Institute of Bankers, of which he had been Treasurer, one of the Trustees and a former President. He had been twice Prime Warden of the Fishmongers' Company; he was one of the originators and the honorary secretary of the Hospital Sunday Fund; and he had sat in the House of Commons from 1880–85 and again from 1892–1905, in which year a baronetcy was conferred upon him.

Amid all these duties, together with those entailed upon him by his position as a country gentleman in Worcestershire, he found time to devote much attention to the affairs of the Royal Statistical Society to the great advantage of the Society during a long period. Sir Richard Martin was elected a Fellow in 1872, having been proposed by Dr. William Farr, the then President, and served continuously on the Council of the Society from the session of 1873–74 onwards. In 1875 he accepted the office of Treasurer, which he held till his death; he was a Vice-President in 1886–87, 1899–1900 and in 1905–06, and was President for the session of 1906–07. On more than one occasion he was a donor to the Library, and contributed the Papers to the Society which are printed in the *Journal*, namely, "Notes on the Purchase of the Railways by the State" (*Journal* 1873, vol. 36) and "The Electoral Swing of the pendulum" (*Journal* 1906, vol. 69.) It may be added that he acted as Treasurer to the Jubilee Grand Committee of the Society in 1885, and also to the General Committee for the reception of the International Statistical Institute at the meeting in London in 1905.

At a special meeting of the Council summoned for the purpose on September 7, 1916, the President moved the following resolution, which was seconded by Sir Athelstane Baines:—

"That the Royal Statistical Society desire to place on record "their deep regret at the loss which they have sustained by the "death of Sir Richard Biddulph Martin, Bart., their late Honorary "Treasurer.

"Sir Richard Biddulph Martin was elected a Fellow of the "Royal Statistical Society in 1872, and was Honorary Treasurer "from 1875 until his death, having thus held that office for a longer "period than any treasurer since the foundation of the Society of "which he was elected President in 1906 and in whose welfare he "always showed the warmest interest.

"He was a constant and most welcome attendant at the meetings "of the Council and its Committees until quite recent years, and "his colleagues will always retain the liveliest sense of the zeal "and courtesy with which he discharged his duties to the Society, "and of the encouragement to Statistical Science afforded by the "active support of a man eminent alike in banking and business "circles and in many charitable and social undertakings."

The President stated on this occasion that the Society had been represented by Sir Alfred Bateman and himself at the Memorial Service to Sir Richard Biddulph Martin, held at St. George's, Hanover Square, on Saturday, August 26, and that Major Craigie, among others, had written to express his regret at being unable to attend.

OBITUARY.

Right Hon. Charles Booth, D.C.L., F.R.S.

Charles Booth was born at Liverpool on March 30, 1840; he was educated there, and at the age of 22 had become a partner in the firm of Alfred Booth and Co. With shipping, commercial, and manufacturing enterprises he maintained a close association throughout the whole of his life, but after about 1886 withdrew himself, sometimes for fairly long intervals but usually for some definite portions of each week, from business claims for the purposes of the self-imposed task of social investigation and for the various activities to which these investigations indirectly gave rise. He was always fragile in physique and his bodily strength had been somewhat impaired in recent years, but an illness of last summer was it seemed being slowly overcome when a sudden relapse brought the end. He died on Thursday, November 23, at Gracedieu Manor, in Leicestershire, at the age of 76, and on the following Sunday was buried in the little neighbouring village of Thringstone.

By his death the Royal Statistical Society has lost one of its most distinguished Fellows and the community a foremost citizen. His connection with the Society dates from his election in 1885, he having been proposed then by Mr. Leonard Courtney, now Lord Courtney of Penwith, and seconded by the late Professor Leone Levi. He served on the Council without a break from 1887 to 1891. In 1889 he was a Vice-President, and was elected President for the Sessions 1892–93 and 1893–94. From 1894–95 to the time of his death he served as an Honorary Vice-President.

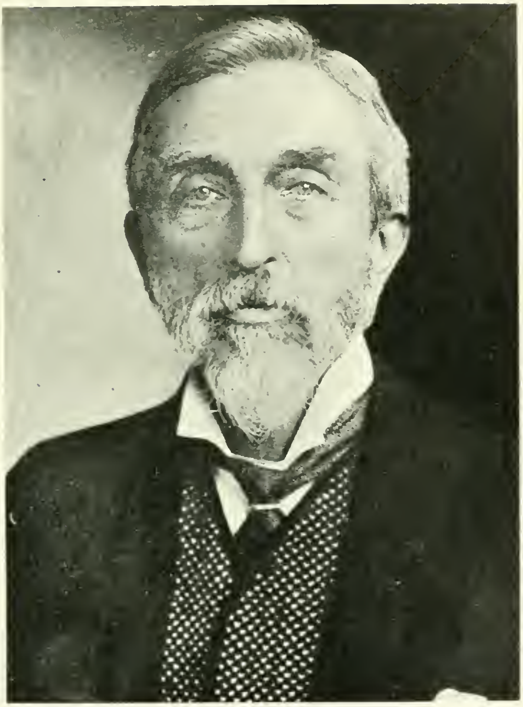
The first fruits of much of his statistical work were contributed to the Society, including the results of his inquiry into the conditions and occupations of the inhabitants of the Tower Hamlets. This paper, read before the Society in May, 1887, was the first instalment of what grew into the great work the "Life and Labour of the People "of London." The year before he had read a Paper on "The "Occupations of the People, 1801–81," and this contribution did much to ensure him the varied co-operation and response that he sought later when pursuing his London inquiry.

In addition to the two Papers just mentioned he contributed the following:—

"Condition and Occupations of the People of East London "and Hackney," 1887.

"Enumeration and Classification of Paupers and State Pensions "for the Aged," three parts, 1891–92.

"Dock Labour," address as President, 1892.



Right Hon. Charles Booth, D.C.L., D.Sc., F.R.S

"Life and Labour of the People in London: First Results of an "Inquiry Based on the 1891 Census," address as President, 1893.

"Statistics of Pauperism in Old Age," 1894.

He was also a generous donor to the Library, and it may be added that the Subject-Index to the *Journal* for 1865 to 1893 was compiled under his guidance, the object of the Index being to show what original work had been published by the Society during that period.

Some of the main features of the great book on London to which reference has been made were outlined from the first: the classification of the people according to the means and position of the heads of families and to the character of their employment; the trade inquiries to show the conditions under which people work; and the district inquiries to show the conditions under which they live.

In its present form the work falls into three series, the first, "Poverty," consisting of four volumes; the second, "Industry," of five volumes; and the third in seven volumes grouped under the generic title of "Religious Influences." A final volume of Conclu-"sions and Survey" completes the work. The celebrated Descriptive Map of London Poverty, showing the streets coloured according to the general condition of the inhabitants, forms part of the first series.

The statistical basis of his well-known social classification of the people was found in the records kept for their official scheduling by the Visitors of the London School Board. In the trade inquiries the enumeration of the Census was used as the basis, supplemented by special returns obtained as to wages, Trade Union organisation, &c., each trade being also made the subject of detailed investigation as to the character of the processes involved, and the prevailing conditions—economic and industrial.

Certain trades or occupations apt to be associated with particular problems of poverty, such as "sweating" or casual labour, were made the subject of special chapters, mainly with reference to East London; while subjects such as the Jewish community of East London, block dwellings, and the Influx of Population were dealt with in separate chapters. The work was costly and the whole expense was borne by Booth. In 1903 the last volume was published, and the preparation of the whole work, now forming seventeen volumes, occupied as many years.

The execution of the entire scheme required the response of large numbers of departments, authorities, organisations and individuals—employers, Trade Union officials, workers, administrators, clergy, and those engaged in social and charitable activities. The co-operation was also required, sometimes for special branches of the work, sometimes for more continuous collaboration, of a considerable number of persons. The various volumes contain the names of these, but the work as a whole, in its inception, design and execution, bears the impress of the great man whose name it bears. Very much of it was written by him, all of it was subjected to his critical survey, and the whole remains a monument of his practical genius, his initiative and his devotion to the common-weal. For the work, although scientific in character, had the direct end of providing a body of analytical fact that could be put to practical uses. He attempted, as he wrote, to give "no body of doctrine," but he set out quite deliberately on a search for truth that should serve a definite social purpose. The great forest of London was there for all to wander in, but it remained for him to chart the groupings of its vast and tangled growth.

"I had," he wrote, "one leading idea; that every social problem "must be broken up to be solved or even to be adequately stated." Hence the comprehensiveness of a plan that would have fallen through had it not been conceived by a man of his infinite patience and unfailing courage and determination.

He sought always for reality, not only in detail as when he made his home from time to time with working class households, or studied after the manner of Le Play their household budgets, but also in regard to general questions as for instance when he recognised the necessity of drawing a sharp distinction between distress and a desire for industrial betterment. The former he would treat; the latter he would foster. But, as he wrote, "it is not by welding "distress and aspiration that any good can be done."

His experience as a man of affairs gave him a clear grasp of the different functions that have to be exercised in successful industry, and none realised better than he the fundamental value of an "ancient "and inbred integrity" in determining worth be it of "master" or "man." He saw London as a complex organic life, and believing as he did in the reality of progress he had immense hopes in the possibilities of its betterment. The sores of its life pained him, but did not depress, and its multifarious manifestations of activity exercised in him an unfailing and sympathetic interest.

He did not shrink from a wide extension of administrative control or of organised effort, and his recognition of the supreme importance of character and of self-reliance left him very far removed from adherence to a policy of industrial *laisser faire*. He belonged indeed to no school—either political or economic. His road was his own, and following it with a rare persistency he stamped on every undertaking, whether a scientific inquiry or some private enterprise, the impress of a peculiarly frank and courageous spirit.

The great work to which reference has been made will probably remain the chief association of his name both as an undertaking that marked a new starting point alike in practical reforms and in sociological investigation, and as a picture and record the historical value of which is destined to increase from year to year. It represents his great scientific achievement. The practical measure that will also be chiefly associated with him is that of 1908 which conferred National Pensions on the Aged. The London Inquiry itself directed his mind to this problem, and it will have been noted that two of the Papers contributed to the Society dealt with it. In 1892 he published *Pauperism and the Endowment of Old Age,* and in 1894 *Condition of the Aged Poor in England and Wales.* A few years later, in 1899, he published for the first time a complete scheme of Old Age Pensions. In the same year a National Committee of Organised Labour was formed to focus public opinion and to bring about the application of the principles which he had promulgated. The movement thus inaugurated was informed and, inasmuch as he had been led to certain conclusions by certain facts, inspired by Booth; but in manner and by temperament he was himself far removed from the propagandist. His quiet force made him nevertheless a most influencing speaker. The impression he conveyed has been recently described by Mr. G. N. Barnes, M.P., who, expecting to find in Charles Booth a man who would touch the heart of some crowded meeting as with "a fiery torch," confesses to the momentary feeling of disappointment which he experienced at the quiet demeanour of this spare man of "methodical habits of address." But, Mr. Barnes continues, he found that "somehow there were "many to do Charles Booth's bidding, and that he had that about "him which inspired others to go out and do what he willed they "should do. His arguments were irresistible, his disinterestedness "transparent, and his simple desire to serve infectious."

The picture is just, though perhaps incomplete, as not indicating a certain intensity of nature, which, when concentrated on a matter concerning which he was convinced, gave him a compelling force of rare completeness and strength. The least pretentious and most unassuming of men, he was still at times one of the most ardent, and his power over others was a bye-product not only of his goodness of heart and of his disinterestedness but also of his determination and courage.

From 1905-7 Booth gave much time to his duties as a member of the Royal Commission on Poor Laws, and in 1910 published a small volume entitled *Poor Law Reform,* embodying two of the Memoranda he had prepared for the Commission. In January, 1908, he had been compelled to resign his seat on the Commission owing to ill health, and he was thus prevented from taking part in the consideration of its Report.

During the last few years his mind had turned to a great extent on industrial problems and, especially during the war, on cognate questions of "reconstruction." In 1913 he had published a pamphlet on *Industrial Unrest and Trade Union Policy.* In this he set out a proposal for a classification of employers to be made by Trade Unionists from the Trade Union point of view so that a certain proportion of any given group—his suggestion was a third—should be "accepted" without bargain or undertaking on either side. The classification, itself to be subjected to revision, was intended to involve no negation of Trade Union activities. These were indeed safeguarded by the conditions of acceptability suggested, including as these did the elements of moral character as reflected in honesty, fairness, liberality and a manifestation of public spirit; the general relationship with workpeople as illustrated by pay and treatment: and the relationships with the Unions themselves.

The proposals, devised to secure at once greater efficiency and greater stability, were under Booth's consideration almost up to the time of his death, and he had hoped to write further upon them. The loss to the community from his inability to do this is great, for the problems with which he dealt in 1913, important then, are urgent now, and the underlying principles which he adumbrated before the war have acquired increasing significance since August, 1914, including as they did a "better appreciation of each others' "position by employers and employed" and "more regard for the "public interests they jointly serve."

As an employer and as a citizen he was very conscious of the constant inter-connection between public and personal points of view, but a very real sense of responsibility, a great power to take the long view of things, left him with a serene and equal mind. His buoyant spirit, challenging, confident, courageous, he maintained to the end, and the memory of it will constitute for many one of the most treasured possessions of their lives.

In 1904 he was made a Privy Councillor. The Universities of Oxford, Cambridge and Liverpool conferred honorary degrees upon him, and Harvard wished to do the same but no opportunity for the ceremony occurred. He was elected a Fellow of the Royal Society, and, in addition to his distinguished connection with the Royal Statistical Society, was one of the Vice-Presidents of the Royal Economic Society.

In 1871 he married Mary, daughter of Charles Zachary Macaulay, by whom, with their family of three sons and three daughters, he is survived. To Mrs. Booth, at once his chief critic and chief inspiration, his great work on London is dedicated.

REVIEWS OF STATISTICAL AND ECONOMIC BOOKS.

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1.—*Labour, Finance and the War* (*being the results of inquiries, arranged by the Section of Economic Science and Statistics of the British Association for the Advancement of Science, during the years* 1915 *and* 1916). Edited and with a preface by Adam W. Kirkaldy, M.A., President of the Section. xviii + 344 pp., 8vo. London: Sir Isaac Pitman and Sons. Price 3*s.* 6*d.* net.

It is very fortunate that some serious thinking about economic problems arising out of the war still continues outside government departments and committees, where all the interesting material is confidential and the analysis of principles and reasons is only manifested through the unsuitable mediums of official publications and ministerial speeches. We owe a considerable debt to the busy experts who have found time to collaborate in producing this volume. Professor Kirkcaldy's chapter entitled "Some Thoughts on "Reconstruction after the War" in effect summarises the material collected by the committee, and is a very thoughtful and well-informed analysis of the problems about which all who have any power to influence action ought to be thinking; whereas Chapters II, III, and IV (Industrial Unrest; The Replacement of Men by Women in Industry; The Effects of the War on Credit, Currency and Finance) suffer from the usual defects of construction by committee and show signs of haste in compilation, this first chapter on Reconstruction is readable, lucid and extremely useful.

The study of the change in the occupations of women is of more interest than the chapter on Credit, &c. (as to which we have gleaned from elsewhere already many opinions worthy to rank with those here expressed), and than the assemblage of not necessarily representative views on which the chapter on Industrial Unrest is based. For the government has not yet published any informative analysis of the movement of women in industry, and few people are able to observe more than a very limited part of this movement. The partial mobilisation of women is, however, the one new phenomenon of the war; we have no experience by which to judge of its permanence or its effects; and, therefore, this presentation of the facts gathered first-hand in the districts of the main industries affected is a most important contribution to a preliminary study of this very interesting factor in the evolution of industry. The numbers exhibited in the tables are, of course, rapidly falling out of date as the process of dilution is accelerated.

It will, however, probably remain true that the movement from other industries to those engaged in munitions is on a much larger scale than the introduction of women formerly not industrially employed; for the number of women unoccupied and belonging to classes permanently capable of occupation is not large, and unless domestic service is permanently denuded there is no source external to industry on which to draw on a large scale.

The question that is being worked out, especially in the engineering trades, is how far women are capable now or can with training become capable of replacing men, especially skilled men. "When women "are said to be doing 'skilled' work, then, what is meant in nearly "all cases is that they are doing one part of the job which a skilled "man performs throughout." "The cases in which women are "completely replacing men in the sense that each woman is doing "the same work and the whole of the work that the men did, are, "for the most part, confined to the lighter unskilled tasks." "A "large proportion of the replacement of men by women has been "made possible by some re-arrangement of methods which brings "the operation within the capacity of the female worker. But "this re-organization means that the woman is not completely "taking the man's place" (pp. 76–7). Such is the stage that, in the opinion of the committee, had been reached in July, 1916. It is evident that, if so much has been done within two years at a time when all attention has been given to output, and training and organization have been subsidiary, we may be watching the beginning of a movement which will completely alter the division between the work of men and women with which we have been familiar. The ultimate effect on women's wages of this possible extension of the sphere of industry open to them may be very great. A.L.B.

2.—*La Richesse de la France devant la Guerre.* Par René Pupin. (Problèmes de Guerre et de Paix). 151 pp., 8vo. Paris: Marcel Rivière et Cie., 1916. Price 4 frs.

This examination into the national income and capital wealth of France immediately prior to the war is a work of importance and permanent value. The author avails himself of all possible resources in his task, and one feels that, although upon many points certitude is impossible, the best has been done that is humanly possible, and the approximations are as near as can be necessary for practical purposes. Apart from the fact that this work is more up to date, it is a definite improvement upon all predecessors. M. Pupin is not subtle, but he is often ingenious, and his bridge-building is fully satisfactory. He knows that all one can attempt to give are figures which are "neighbours to reality"—not an absolute picture of existing wealth: but he is clear that for a long time past the wealth of France has been underestimated. He establishes—without discernible political preconceptions or bias—that the share of Capital in the national income is less than that of Work, that the two together may be capitalized at 13 per cent., and that one-tenth of the annual income is saved. In his direct valuation, he is on fairly secure ground until he deals with private trading, when, having no established taxation figures, he falls back upon the classification of establishments according to the number of employees, and uses a multiplier for each grade. English workers along these lines will be interested to see that he adopts house values as a means of estimating the value of furniture (assuming that the value of furniture is equal to the house value for medium sized premises, but adopting fractional values for large and small houses) and the whole value is put at 80 million pounds. The net total of the valuation at 1911 is 11,420,000,000*l*. He then devotes himself to valuation by reference to succession duties, and here perhaps his work is least satisfactory, for he is evidently unacquainted with recent English work upon the "multiplier," and although suggesting useful adjustments in the material of his work, does not grasp some of the fundamental difficulties involved. One has the suspicion borne of envy when his total comes out to within eighty millions of the direct valuation!

The reason is not far to seek. He is of opinion that by using the multiplier 35, piously handed on by each authority, the total wealth has been undervalued. so he takes periods when the succession values are known and the *capital values are also known* for "valeurs "mobilières," and finds the requisite quotient to be over 50; whereupon he promptly adopts a new multiplier. But this is circular reasoning, and no method which does not base the multiplier upon vital statistics can be really convincing. In his estimate of income from labour, he adopts census categories with an average wage, in the ordinary way, and gives some interesting details. The average income in agriculture is 38*l*. a year, and some of the averages for professions strike one as extraordinarily low: doctors, 180*l*.; chemists, 160*l*.; dentists and veterinary surgeons, 120*l* (in each case excluding those who act as assistants); teachers and lawyers, 60*l*.: while engineers and architects are put at 120*l*. where they have at least two employees. These figures are evidently founded upon reasonable information.

The estimate of the growth of wealth puts the new capital annually, on the *average* from 1878 to 1903, at 80 millions, and from 1903 to 1911 at 140 millions, as a net amount. This agrees with the estimate made by M. Paul Leroy Beaulieu in 1912.

A chapter is devoted to the depreciation in values due to the war, which is estimated at an average figure of 23 per cent., and in this connection the author deals eloquently with German documents which are little known in England. In particular, the *Memoire secret* reveals the intentions and ambitions of the agricultural leagues; *inter alia* by the conquest of the line of the Meuse and of the canals, and coal and iron departements "la propriété moyenne "et la grande propriété passeront en des mains allemandes: la "France *indemnisera les propriétaires, et les recueillera*." Another manifesto from German universities (August, 1915) says that Russia will pay indemnity "*en nature*, mais en territoires *sans propriétaires*"! In such ways do our enemies propose to circumvent Mr. Norman Angell.

The annual income is put at 1,440 millions, so that it is proportionally much lower than the British income (at 2,100 millions) than might be inferred from the capital, 11,420 millions, against, say, 14,500 millions. The share of income going to capital is given as 470 millions only. It is now difficult to say whether or not agriculture in France predominates over industry.

The author closes with a consideration of future prospects. The high rate of interest will stimulate effort and saving, and capital in France is to find itself "plus vivant, plus prolifiques et tout en "muscles"—a great lever of strength which will astonish all. But the hope that Austro-German tribute will lighten public charges seems likely, by its deferment, to make the heart very sick! If this work is superficial upon the economic side, it is at any rate comprehensive and worthy in its statistical achievement when every limitation has been considered. J.C.S.

3.—*Finances de Guerre Comparées.* Par Albin Huart. 123 pp., 8vo. Paris: M. Giard et E. Brière, 1916. Price 2 fr. 50.

This work, by a practised writer upon financial questions, brings the story up to June, 1916, and does not greatly concern itself with prophecy. Like all such work in passing, it suffers a little in perspective and probably also in emphasis, but it is a good serviceable account of the main facts of the banking, credit and exchange situations in each of the chief belligerent countries. The opening chapters on the financial factor of victory and how the belligerents provide for the expenses of war contain nothing distinctive, but the contentions are generally sound and well reasoned: borrowing is regarded as the only possible safe course in a country suffering directly or deeply in the war, though indirect taxation combined with it gives the best results if it does not weigh too heavily upon working power; but the exigencies of the treasury are best served by income taxes and taxes on war profits. Throughout the work the premier place is given to British methods of finance and the special steps taken during the war, while the expectation is expressed that our recovery to budgetary equilibrium will be easy and rapid. The German and Austrian banking and monetary situation are described in some detail, and adversely criticised, but the author's main thesis, eminently comforting to the reader, is upon the lesson of the exchanges. Although Britain and France have all the factors of excessive importation which should make for adverse exchange, and Germany has hardly any, yet in fact it is found that the depreciation in the former is negligible and in the latter case most marked and continuous, for which there can be no reason save a real depreciation in credit itself due to dubious financial expedients and inflation. He concludes that the Entente has a gold stock of 15·2 milliards of francs, while Germany has 3 milliards only. Upon the question of the exchanges, it is encouraging to find that M. Huart's tables when brought up to date are even more striking:—

	Normal.	June, 1916.	December, 1916.
New York	95·28	76·00$\frac{3}{8}$	66·00$\frac{3}{8}$
Amsterdam	59·26	44·42	38·87
Switzerland	123·45	96·90	79·90
Sweden	88·88	61·35	56·00

This depreciation exists equally for Austria, and compares strikingly with the comparative steadiness of the British and French rates. Among other lessons urged in the useful work is the "democratisation" of the cheque in France, for which real efforts are now being made.

J.C.S.

4.—*L'Impôt sur le Revenu.* Par Just Haristoy, Docteur en Droit. 142 pp., 8vo. (Extrait de la *Revue de Science et de Législation financières.* Janvier, 1916). Paris: M. Giard et E. Brière, 1916.

This work is a very readable account of the new French income tax, a kind of expanded "Exposé des motifs," together with the text of the law, regulations, and some of the forms. It is adequately but not excessively documented, and serves both for the general reader or student of principles and as an actual guide to interested taxpayers. It is not, however, quite full enough to give real enlightenment to any British business men having establishments in France.

The French have occupied themselves more or less vigorously since 1871 with income tax schemes—some two hundred in number!—and it was a stroke of unkind fate when after infinite discussion they had succeeded in screwing themselves up to the sticking-point over what seems to them a very distasteful job, that a war should break out just as the law was to come into force, so that, as part of the taxable area was in enemy occupation, and a large proportion of the taxpayers were in the fighting line, postponement became necessary. But as there are still some in quiet enjoyment of their incomes, able to make the all-important "declaration," the scheme comes into force in 1916 for their benefit. It is, of course, generally known that this tax is a low-rated sur-tax imposed "globally" upon total incomes, the separate parts of which continue to be subject to the separate taxes (patentes, &c.). In many respects it is unique amongst income taxes, and this book is worth studying for its side-lights upon French character, and the relations between, and relative wisdom of, the Chamber of Deputies and the Senate, whose differences of opinion on points of principle are vividly set out. The examples given show the actual legal provisions more clearly than pages of description, and one may perhaps be given here as interesting and typical:—A taxpayer with a wife and two children has a total income of 1,200*l.* The "taxable income" is found by deducting (*a*) 200*l.*, general exempt minimum, (*b*) 80*l.* the allowance to married taxpayers; (*c*) 80*l.*, the allowance for two children, or 360*l.* in all. The tax upon the balance, 840*l.*, is computed as follows: 200*l.* pays on one-fifth, or 40*l.*; 200*l.* upon two-fifths, or 80*l.*; 200*l.* upon three-fifths or 120*l.*; 200*l.* upon four-fifths, or 160*l.*, and the balance of 40*l.* in full, so that 1,200*l.* real income becomes 840*l.* taxable income, which in turn becomes 440*l.* subject to duty, which, at 2 per cent., is 8*l.* 16*s.* But this duty is again reduced by 10 per cent. because there are two children, so that the actual payment is rather less than 8*l.* The number of taxpayers where full charge is possible is 420,000, but at present the yield is expected—and it seems with good reason—to be trifling: "un impôt de statistique." A great part of the book is taken up with the engrossing question of the preservation of privacy, despite the "déclaration" which is irreconcilable with "les mœurs et le genie de notre race," consistent with adequate powers to the administration. The question is settled in a very unsatisfactory, makeshift manner, which must be radically improved if the tax is ever to succeed, or be more than a voluntary contribution. This makes very interesting reading, and one can well understand why the author does not conclude upon a very optimistic note. J.C.S.

5.—*Trust Laws and Unfair Competition.* By Joseph E. Davies, Commissioner of Corporations, Department of Commerce, Bureau of Corporations. liv + 832 pp., 8vo. Washington: Government Printing Office, 1916.

This bulky report, dated March 15, 1915, was prepared partly to furnish information to the United States legislature in connection with proposed legislation to supplement the anti-trust laws, and in especial it gives the results of an investigation into unfair methods of competition in connection with the decision of Congress to establish a Federal Trade Commission with powers to deal with undesirable practices. It opens with a historical review of anti-trust legislation in the United States, from which the conclusion is drawn that "the law has been an important factor in shaping the forms of "business organization." The early common form of combination was the "pool," but a number of cases tried in 1887–89 showed that the courts would not enforce contracts for the destruction of competition and the institution of monopoly. The classic form of "trust" began with the Standard Oil Company in 1879, and soon obtained many imitators. It was declared illegal in the Sugar Trust case in 1890, and was succeeded by the device of the "holding company." The Sherman Anti-trust Act of 1890 prohibited all combinations in restraint of trade and all attempts at monopoly. Pools were declared illegal in the Addyston Pipe and Steel Company case and the holding company in the Northern Securities case of 1901–04. The way was then clear for the merger of businesses, but the public had become terrified by the great growth of combinations, and the investigations conducted by the Bureau of Corporations (established 1903) provided abundant material for the Government. The prosecution of the Standard Oil Company and Tobacco Trust in 1911 resulted in decrees for the dissolution of the mergers into a number of independent units. With regard to the Standard Oil Company "the general "opinion is that this dissolution is effective neither in theory or "in practice," while "the Tobacco Company dissolution has been "criticised in the same way as the Oil Company dissolution, but "probably with less force." Another case against the United States Steel Company failed, while one against the International Harvester Company succeeded in the lower court, but an appeal to the Supreme Court was pending when the Report was written. There still remain the "gentlemen's agreement" or "system of "co-operation," an elastic and elusive form of combination with which, so far, the law does not appear to have been able to cope, and we seem likely in America to be left with the odd paradox of monopoly resting on honour in business.

This summary is developed in two chapters dealing with common law decisions in regard to agreements in restraint of trade and with the Federal Anti-trust Laws and their interpretation, full précis of the decisions in leading cases being given. This collection will be found very useful by students of business as well as by students of law, while many interesting comparisons can be drawn from those chapters and from the following chapter on important provisions of state anti-trust laws. It is somewhat significant that the non-industrial states are prominent in this legislation. There follows a comprehensive review of trust laws in foreign countries, which naturally suffers a good deal from compression. Six pages are given to England and deal with common law, railways, and patents. Naturally they are very jejune, and the conclusion that "in the "interpretation of the common law the courts appear to favour "freedom of contract more than freedom of industry" has a flavour about it of "that blessed word Mesopotamia." An important case like that of Taddy *v.* Stevious dealing with the fixing of retail prices by manufacturers is omitted. But we cannot blame the American writer seriously for his defects. Too badly do we require a full history of the English law dealing with combination and an analysis of its bearing on competition. Here there is a good field for the student.

What may be called the second part of the book embraces five chapters dealing with unfair competition from the business and economic viewpoint, unfair competition at the common law, Federal statutes respecting unfair methods of competition, State statutes concerning unfair competition and certain related trade practices, and unfair competition in foreign countries. A good deal of space is devoted to the law relating to inducing breach of competitors' contracts, enticing of employees, betrayal of trade secrets and confidential information, defamation of competitors, passing off of goods, secret rebates, and other forms of unfair competition towards competitors, which may be roughly summed up as more or less subtle forms of theft. A more modern view of unfair competition is where the effects on the consumer are brought into the foreground, although the immediate result may be the ruin of business rivals. Considered in this way the chief method is price-cutting either in general to ruin a competitor or to force him into a combination, or price-cutting in one commodity or locality when conducted by a firm which trades in many commodities or places against a rival who trades only in the line of goods where prices are cut or who has shops in one town. In all these cases the inference is drawn that when the immediate object is achieved prices will be put up above their former level to the detriment of the public and to the profit of the successful participant in the war. The extent to which a large combination may employ such practices may be seen from the example of the American Tobacco Company which sent men through the territories where rival brands were favourites to distribute a plug of the company's "Battle Axe" brand to every man they saw. "During the four years, 1895, 1896, 1897, and 1898, the "company made a net loss on its plug business of $3,300,000. But "it effected its purpose by obtaining during these years and the "years immediately following a substantially monopolistic control "of the plug tobacco market."

For the purpose of combating unfair competition, as well as for the general investigation of corporations, the Federal Trade Commission Act of 1914 established a commission with administrative and quasi-judicial functions. Declaring that "unfair methods of "competition in commerce are hereby declared unlawful," the Act directed the commission "to prevent persons, partnerships, or "corporations from using unfair methods of competition in "commerce." After taking evidence the commission could issue an order requiring the guilty party to desist from the practice complained of, and in case of failure to obey could appeal to the court of appeals, which could then either affirm, modify, or set aside the order of the commission. In the same year was passed the Clayton Anti-trust Act which declared that it was "unlawful "for any person engaged in commerce, in the course of such "commerce, either directly or indirectly to discriminate in price "between different purchasers of commodities" or to sell goods on condition that the buyer dealt exclusively with the seller. The same Act prohibited corporations from acquiring stock in other corporations "where the effect of such acquisition may be to lessen "substantially competition between" the corporations or "tend "to create a monopoly of any line of commerce." It also prohibited the employment by different corporations of common directors.

The final chapter deals with the activities of trade associations and their relation to laws concerning competition. In an Appendix are the texts of the Canadian and Australian combination laws, the German potash monopoly law, the Italian law for a Sicilian sulphur monopoly, Russian sugar law, Roumanian petroleum distribution law, Brazilian coffee valorisation law, and the German law of 1909 against unfair competition. There is a good index and a table of cases. H.W.M.

6.—*The State as Manufacturer and Trader. An Examination of Government Tobacco Monopolies.* By A. W. Madsen, B.Sc. 282 + ix pp., 8vo. London: T. Fisher Unwin, Ltd., 1916. Price 7*s.* 6*d.* net.

There is a strong tendency for the functions of the State to increase; at no distant future we may find almost every kind of business carried on by the State. It is important therefore to study, as best we may, how far the State is likely to conduct business better than the private capitalist. It happens that many Governments do already carry on the business of manufacturers and dealers in tobacco; this is done with the primary object of obtaining revenue; but revenue can equally be got by the taxation of tobacco as in Great Britain and Germany. The question thus arises—can it be got equally well? Let us compare the two methods from all points of view—the amount of revenue raised, the quality and variety of the goods supplied to the consumer and the pay and conditions of the employés. Mr. Madsen's book enables us to do this. He gives a careful account (based on official and unofficial sources) of the chief tobacco monopolies, those of France, Austria, Italy, Japan, Spain and Sweden. He analyses the accounts and statistics, and tells us something about the way in which consumers and employés are treated. The upshot is a crushing condemnation of Government tobacco monopolies. They prove to be bad from every point of view. Let us take the French monopoly as an instance. This is admirably described in M. Caillaux' well-known book *Les Impôts en France*, from which Mr. Madsen has done well to reprint in an appendix the account of the regulation and supervision of tobacco growing under the monopoly. What is the result of the French monopoly? Any smoker who crosses the Channel finds French tobacco inferior to English. But what about the profits? Before the war these were said to amount to nearly 17½ million pounds. But did they? Mr. Madsen detects the omission from the debit side of many items, such as rent of land and buildings, interest on plant and stock, proportion of expenses of the indirect taxes administration, the equivalent of exemption from rates and taxes. He proves that the true profit was less than that stated by at least 880,000*l.*, and probably by a considerably larger figure. He also gives ample evidence of the bad quality of the goods sold, of the complaints of retailers and the low wages of employés. In other countries the tale is much the same, although Italy is more honest in its book-keeping. The same points recur. As a fiscal machine a monopoly does not seem to be any better, indeed it is less efficient, than a direct customs and excise duty; the consumer always suffers greatly, and there does not seem to be any countervailing advantage. Mr. Madsen's book is not very light reading, but it is a careful and painstaking study, enriched with valuable statistical tables and references to the available authorities, both official and private. In the light of the experience of other countries, it is difficult to understand why Sweden has recently adopted a monopoly; it seems safe to prophesy that its results will not be satisfactory. Let us hope that, whatever fiscal changes we may see in this country, our tobacco may be taxed and not monopolised.

C.P.S.

7.—*The Colonial Tariff Policy of France.* By Arthur Gérault. viii + 305 pp., la. 8vo. Oxford: The Clarendon Press, 1916. Price 7*s.* 6*d.* net.

This book appears under the sponsorship of Professor Gide. It is one of a series issued by the Carnegie Endowment for International Peace. From an introductory note by the Director of the Economics and History Division, we learn that that was "organized to promote a thorough and scientific investigation of the "causes and results of war"; and from this note of Professor J. B. Clark, as from a "general appendix" containing the reports of the commissions appointed at a conference held at Berne in 1911, we gather that "protectionist policy" is placed in the category of "those economic influences which in time of peace bring about "clashing interests and mutual suspicion and hostility." Such we take to be the reason for including this survey of the past and present state of the fiscal relations of France to her colonial possessions among "studies in the causes of warfare." The author has formed no favourable opinion of the principles and motives which have mainly guided and inspired the action of the French, and his bias towards the theory and practice of Free Trade is not disguised. It should, however, be added that the responsibility of the editor who, as the French member of the Committee of Research, had to select an investigator, to read the completed manuscript, and to settle whether it merited publication, does not extend to the views expressed.

We have no doubt indeed that all who consult this monograph, whether they agree or disagree with the fiscal standpoint adopted, will be grateful for the painstaking contribution made to economic study. The general plan of arrangement is as simple as it is appropriate. The first part of the book reviews the different phases through which the colonial tariff policy of France has passed. In the second the colonies are considered in groups, or individually, and the policy pursued in each case is in turn examined. During the three centuries that France "has been a colonial power" her attitude has varied from "jealous exclusion" to an inclination "towards a "liberal disposition." Nor, again, has she "always followed the "same policy in all her colonies." To-day, in West Africa, where the "open door" is found, her action is "entirely different" from that in Madagascar, where exclusion is discovered. We cannot therefore "reduce" the policy to "a single all-embracing formula."

Starting under the *ancien régime* with privileged companies and exclusion, the Revolution, in accordance with ideas then dominant, initiated but did not develop a liberal policy. Reaction under Napoleon brought back exclusiveness without the privileged companies; and the first half of the nineteenth century saw no departure from this attitude. The liberal economic tendencies, however, of the Second Empire mark a fourth stage. "Exclusive "reciprocity" between the mother-country and the colonies was abolished, and a "regime of tariff autonomy was adopted." Then in 1882 came a "complete change of opinion," with "protectionist "reaction." A movement began in favour of a customs union with the colonies, and culminated nine years later in a law passed in January. This stage, in which the colonial consumer was "openly sacrificed to the producer of the imperial state," Professor Gérault describes as that of "tariff assimilation." Finally, he says, in 1913, the sixth stage has been reached. Some concessions have been granted in response to the complaints of the colonial party "against an iniquitous regime," and others now seem imminent. "An ingenious formula, tariff personality, sums up the colonial "aspirations" and "the triumph of this new policy may be expected." From this brief summary the author's personal bias can be discerned, but nevertheless, in his review of each successive period, he conforms to the condition, rightly laid down, of taking account of "attendant "economic and political circumstances."

Passing in his second part to the results of the policy pursued, he considers groups or individual colonies in turn. The general conclusion reached is that "not one of the non-assimilated colonies" "asks to be transferred to the class of assimilated colonies," while of the latter variety "not one is satisfied with its lot." The reason is plain. The "inevitable defect" of tariff assimilation is "its "lack of flexibility." The legislators of 1892, failing to realize that "not only do the colonies not resemble the mother-country but that "further" they differ fundamentally among themselves, in abolishing tariff barriers, were, unlike their predecessors of the Convention, who cherished the generous ideal of fraternity, actuated by selfish motives. "The interest of the French manufacturers "was the dominant consideration." A distant trade is, in fact, often forcibly substituted for a neighbouring trade, as Adam Smith contended in his criticism of the old English colonial policy. Irritation is engendered, and only one industry is seriously concerned in the maintenance of the national tariff in the French possessions. That is the cotton manufacture, which has conquered the markets of Madagascar and Indo-China. But the colonies are generally poor and thinly populated, and the high cost of living and the difficulty of raising revenue caused by the tariff hinder their development. Such is the indictment brought, and while Professor Gérault is more obviously an advocate than a judge, his arguments, supported as they are by facts, must receive careful consideration. For Algeria alone, he admits, tariff assimilation is a "real and material "advantage," for which tariff autonomy would be an undesirable exchange. For the colonies proper he contends that it has been a delusion, though Tunis, now autonomous in fiscal matters, would benefit by a customs union with Algeria. L.L.P.

8.—*Le Protectionnisme et l'Avenir Économique de la France.* Par A. Daudé-Bancel. 63 pp., la. 8vo. Paris: Giard et Brière, 1916. Price 2 francs.

Economic Protectionism. By Josef Grunzel, edited by Eugen von Philippovich. xiii + 375 pp., la. 8vo. Oxford: The Clarendon Press, 1916. Price 8*s.* 6*d.*

Differences between Free Traders and Protectionists may be reduced but can rarely, if ever, be removed. For such conflicts are often, perhaps generally, due to a fundamental opposition of belief that obviously exists between the convinced adherents of a creed, which contrasts the "natural order" of "free" competition between individuals with the "artificial interference" of the State, and the less rigid and more opportunist propagators of a policy, who hold that the authority of Governments dates back to the emergence of a civilized society from the irresponsible disordered life appropriate alone to primitive savages. Or, if the disagreement be not traced to this remote point in the evolution of ideas, and it be reluctantly or willingly conceded that official action can play a part in impelling or discouraging the persons or the classes of whom a nation is composed, a stubborn controversy may yet arise on the correct occasion and desired scope of an influence allowed to be legitimate and not abnormal. The two books before us, the one proceeding from a French and the other from an Austrian source, are types of these different points of view, as they are representative of the nationality of their authors.

M. Daudé-Bancel's brief Essay is vigorously written. It puts up a strong defence for a free trade policy for France after the war is over. It contains a forcible exposure, made with evident zest, of the fallacies and perils of Protection. But it has sometimes been remarked that, in fiscal theory, the proverbial description of the supporters of a despotic ruler as being "plus royalistes que le "Roi" is applicable to French Free Traders. Certainly "orthodox" economists across the Channel have carried the cognate doctrines. associated with the older school of English writers, to a logical extreme from which some of the leading minds among the latter, with their racial love of compromise, refrained from going.. The present author quotes abundantly the clever special pleading of the past contained in Bastiat's amusing pamphlets, and he is, it is clear, no half-hearted follower of his brilliant veteran contemporary M. Guyot who never flags in what some less confident or bold bystanders may regard as the thankless admonition of his erring countrymen. M. Daudé-Bancel entertains no doubt that Protectionists sin against the light both of thought and of fact. He is sure that their policy must impoverish a country. It must, he argues, coddle parasites destructive of its real welfare. Backward industries are sheltered from the fitting consequences of their backwardness; while the interest of the consumer, which appeals with special force to one holding, as he does, the office of General Secretary of the National Federation of "cooperatives de "consommation," is sacrificed to the supposed benefit of the producer. Dumping brings no unmitigated harm and free exchange guarantees peace instead of war. Such are some of his declarations. It must, however, be confessed that the argument of the essay is not, for the most part, new, and that the familiar reasoning lucidly put forward might be termed by an opponent superficial.

The other book is of a different character. In its magnitude alone it reaches the dimensions of a treatise as contrasted with a pamphlet. Lacking the verve and enthusiasm of the French expositor it exhibits the solidity and thoroughness we have become accustomed to associate with German erudition. The treatment of the subject is also new; for an honest endeavour is made to examine, without prejudice or favour, in all their bearings, and with reference to every species of the genus, the theory and practice of "economic protectionism." It is refreshing to find that the traditional antithesis between what is "natural" and what is "artificial," which, as we have noticed, has figured so conspicuously on many pages of past controversial literature, does not make its appearance in this book until towards the close: and it is not employed, as so often previously, as a mode of determining beforehand debateable, if fundamental, questions.

The author indeed reaches the conclusion that protection is legitimate or inevitable in the actual environment in which we live. He follows, but develops, a conception of his editor, Professor von Philippovich, who, is however, responsible, not for the views expressed, but, only as a member of the Committee of the Division of Economics and History of the Carnegie Endowment for International Peace, for the selection of the writer. Dismissing the possibility of a state closed entirely to external influences on the one side, and rejecting, on the other, the impracticable notion of a world economy, in which countries would become commercially and industrially like individuals, Dr. Grunzel holds that protection should mould the relations of a "national economy" to a larger area. He defines protectionism as "the totality of those measures "by which the national economy seeks to promote its interests in "the world economy field." "The essence of the concept," he adds. "includes an interrelation between national economy and world "economy, between home production and the home market on the one "hand, and foreign production and the foreign market on the other."

His treatise is divided into three parts, the first considering the "genesis" of economic protectionism, the second indicating the "directions" which it assumes, and the third investigating its "effects." To the policy he gives a wider extension than that commonly assigned. Not merely is it concerned with goods, but it deals also with capital and with labour. For the importation and exportation of capital, and the immigration and emigration of labour, may be encouraged or discouraged by a nation in its relations to the world: and, in the case of goods also, the ordinary method of duties upon imports or of bounties to exports, which is open to inspection, may be supplemented by the less patent, but not less effective instruments, of varied freight rates, and of administrative act, through veterinary police, excluding cattle suspected of disease, through patent laws, compelling factories to be opened within privileged areas, or through the bestowal or refusal of public contracts. Even the weapon of "concerted popular action" exerted by such means as a boycott may be employed. The policy is favourably regarded for reasons different from those often advanced. Neither the fostering of infant industry, nor the need of furnishing some counteraction to advantages enjoyed by foreign rivals, is put forward as the sufficient cause. But stress is laid on the "defensive," rather than the "developmental" or "compensatory," theories. And, as "national economy" is a permanent and not a passing phase, so fiscal policy is likely to maintain, and not destined to abandon, such defences. The whole discussion, we would repeat, is noticeably comprehensive, and it has also, we think, the merit of novelty. It deserves attention even from those controversialists who may dissent from the conclusions reached. It is the most scientific and "objective" study of the question we have yet encountered.

L.L.P.

9.—*Les zones franches et l'exportation française. Documents et Arguments réunis par la Chambre de Commerce de Marseille.* 255 pp., 8vo. Paris: Librairie Félix Alcan, 1916. Price 3 fr. 50.

"Our Customs laws have as their avowed aim the increase of "prices in France, and they have as a consequence the weakening, "among the manufacturers, of the stimulus of competition, to the "detriment of quality; hence our goods cannot compete abroad "with the goods whose competition we fear at home!" (p. 55). Thus M. Adrien Artaud, President of the Marseilles Chamber of Commerce, describes what Protection has done for France. But it does not appear that he desires the reversal to a Free Trade system: he simply asks (and he represents the Chamber of Commerce) that the Protective system shall be rounded off by the establishment of a number of "free zones" or free ports. These are regions or areas "declared neutral from the Customs point of view, where "goods may be landed, warehoused, inspected, looked after, sorted "and classified, manipulated, bought and sold, and re-exported, "without the payment of any Customs duty, and without undergoing "any of the formalities associated with Customs administration, "this Administration confining itself to watching the boundaries "of the free area, and preventing the introduction into the Customs "territory of prohibited and fraudulent goods" (p. 107).

The object sought after is the incorporation of French produce and labour in foreign goods which at present simply pass through France "in transit." The value of the "re-exported" goods would thus be enhanced, foreign markets would, it is argued, be extended and new ones secured, and the adverse "balance of trade" against France would, to some extent, be rectified. In this way it is hoped to enjoy, side by side with the Protective system, some of the advantages, as regards external trade and shipping, attaching to "more liberal" Customs systems.

The question of establishing free zones or ports in France is of long standing and highly controversial, many people thinking that the needs of the situation can be adequately met by reforming and extending the bonded warehouse system. The principal opposition comes from those who fear that the goods, mainly of foreign origin, exported from the free areas would oust from the world's markets the French products made within the Customs area. It is not surprising that a manufacturer established in, say, Paris should object to setting up a duplicate factory in a free port in order to preserve his export business.

There are, however, undeniable advantages associated with free zones in a highly protectionist country, and the matter is argued at length in the book before us. The book is not a treatise, but, as indicated in the sub-title, simply a collection of documents, speeches, &c. It is propaganda, and as such is not devoid of the faults of exaggeration. But the Marseilles Chamber of Commerce has presumably taken care to make out the best possible case for free zones, and the book is therefore worth consideration by those who are, or may be, interested in the subject-matter. A.D.W.

10.—*Central Europe.* By Friedrich Naumann; with an Introduction by W. J. Ashley. Translated by Christabel M. Meredith. xix + 354 pp., 8vo. London: P. S. King and Son, 1916. Price 7*s.* 6*d.* net.

This treatise, we are told, was written "of set purpose in the "midst" of the fighting because "it is only in war time that our "mood enables us to entertain broadly transforming thoughts of "reconstruction." It is described by Professor Ashley as "far and "away the most important book that has appeared in Germany "since the world-conflict began." He declares that "it expresses "with a contagious enthusiasm aspirations already deeply rooted "in many German minds; it makes out of them a systematic "scheme commended by eloquence and buttressed by historical and "economic learning." The subject is "the growing unity of those "nations which belong neither to the Anglo-French western alliance "nor to the British Empire." But, "more particularly," it is the "welding together of the German Empire and the Austro-Hungarian "Dual Monarchy." That is the step, to be taken at once, towards the future realization of the larger project. Of this immediate plan the ultimate aim is unmistakably military and political combination, but the means of union now contemplated are mainly economic, and the method recommended is the elastic plan of mutual preference.

The reader whose appetite may be whetted by this foretaste will find a substantial meal provided for his digestion. The book has the defects, as it possesses the merits, of German writing. The touch is heavy rather than light. The affection for a theory becomes a bondage; and the absolute tone and the dogmatic iteration may tire or even nauseate some readers. Yet they are not more conspicuous than the firm hand with which the outlines of the policy are drawn, and the industrious pains lavished on its elaboration. The historical background is adroitly supplied; and we are almost convinced that Bismarck and Andrassy, the former by sparing Austria further humiliation in 1867, and the latter by declining to aid France in 1870, discerned the need and laid the basis of "Central "Europe." Nor is Dr. Naumann less skilful in removing the risk of the friction that might be caused by unnecessary meddling with religious faith or racial attachment. Obstacles, indeed, are frankly faced and difficulties dexterously smoothed throughout. The account of the existing financial situation of Germany and Austro-Hungary is ingenious if it is not wholly accurate. Yet some inconsistency appears from time to time in the reasoning employed, and the suggestions dropped and the admissions made are not the least significant.

From Professor Ashley's informing introduction it would seem that Germans contemplate continuance of the advantage given in the past by the "most-favoured nation" clauses of commercial treaties with the exclusive conquest of the close privileges promised for the future by Dr. Naumann's policy. In his book they are to create an economic preserve in Central Europe, but they also desire to retain the overseas trade, which is no less important, while they cannot realize as inevitable a permanent loss of colonies. That is one seeming contradiction which is not resolved. A second inconsistency is similar in character. Dr. Naumann consults the susceptibilities of the Austrians and Hungarians, and, outwardly at least, he treats the partners in the projected combination as equals, conferring and receiving benefit from a more intimate connection. But an *arrière pensée* is scarcely concealed; and he evidently contemplates the Dual Monarchy as destined to be subordinate.

He holds, as the outcome of present experience which may yet prove to be abnormal, that, with "trench warfare," the future must lie with large and not with small communities. Neither the Germans of the German Empire nor the mixed peoples of Austro-Hungary can afford to stand alone. To some extent, however, economically regarded, they can supplement each other's wants; for the one, especially Hungary, is still primarily agricultural, while the other has become preponderantly manufacturing. In other respects they are also thus related. German efficiency, traceable to that "insertion of the individual ego in the joint ego," which is shown by state regulation and by cartels and by syndicates, might get from Austria "the charm" which would render it more "tolerable" to the outside world. While "technically" the German Empire is superior as a state, Austro-Hungary is a more "natural growth."

Such are some of the admissions of this "candid friend." We have not the space needed to notice all Dr. Naumann's *obiter dicta*, which may be fairly termed illuminating, but we must mention a few. We are told, as we have seen, that the Germans are not generally liked. "We are, historically," our author says, "a "half-finished product" with a "touch of the primitive" and "of something still capable of improvement." We are informed that in their conduct to Denmark and to Alsace-Lorraine his countrymen have made mistakes. "A great deal that was mean, "and of which we are ashamed has been done in the name of "Germanism." While they are only "passably good colonists," Russians are more felicitous in dealing with semi-civilized peoples, and England's elastic methods of government have been demonstrably successful. The British command of the sea is still a reality; and, after the war, in Greater Britain "out of a colonizing "country will develop a State of incomparable self-sufficiency as "regards agriculture and raw material and with its own developing "industries." In fact, Central Europe can only hope to occupy, "in the most favourable event," a fourth place among world states, for Britain, America and Russia will take precedence. Its need, however, is imperative, for France has definitely thrown in her destiny with England, in Italy the national humour and economic interests, obvious though the latter might seem, are "inharmonious," friendship between Germany and Russia is unlikely and repugnant, and a Germany allied to England would have to subserve the wants and promote the interests of her more powerful partner. Through the transparent medium of this book we may "see ourselves as others "see us" and derive some encouragement from the process, while the merciless revelation of German shortcomings cannot be otherwise than heartening to her opponents in the war. L.L.P.

11.—*Le Commerce Allemand—Apparences et Réalités.* Par Daniel Bellet. Troisième Edition. 318 pp., 8vo. Paris: Plon-Nourrit et Cie. 1916. Price 3 fr. 50 c.

In this book a thorough candid investigation is attempted by a cool industrious inquirer into the facts, and causes, commendable or the reverse, of the commercial development achieved by Germany before the outbreak of the present war. The author whose avowed object is to distinguish "realities" from appearances is careful to avoid exaggeration, either of the advance of Germany, or of the decline of his own or other countries, in the business of the world. Nor is he less scrupulous in his discrimination between the skilful use of qualities which deserve respect, and will reward imitation, by the French or by other nations, and the adroit unenviable employment of methods of guile or intimidation belonging more obviously, if even there they are appropriate, to that "frightfulness" of war which had earned for those responsible for their practice the reproachful designation of the "modern Huns." He will not allow indeed that German commercial progress can be directly traced to past military success; nor will he admit that, if the proper tests of measurement are applied, the gloomy comparisons sometimes made between German success and French or British failure have been demonstrated. But he nevertheless acknowledges that the march of German industry and commerce had been noticeably swift, and that a veritable "invasion" of some regions had been latterly accomplished by German business enterprise. Nor does he fail to urge that England should not be content to "rest upon her oars," and that France has suffered loss because she has not turned to good account some expedients followed with success by German traders and administrators. There is, he contends, something to be learnt positively as well as negatively from Germany's example.

German military success brought, no doubt, prestige; but the huge indemnity claimed from France, while it permitted the introduction of a new monetary standard, and provided for the repair of some damage wrought by war, was of doubtful further benefit. The Zollverein it was which had prepared the ground effectually for subsequent development; and the action at one time of Bismarck and, later, of Caprivi had similarly shown the marked advantage of a liberal fiscal policy. Certain German qualities, however, were more extensively responsible for the success achieved. An obsequiousness, which was ready to study assiduously the whims of customers, a love of method and organization, and perseverance mingled opportunely with audacity were some of these. The results unquestionably were gratifying, although the absolute increase of German business was not so great, if the growth per head of the population were substituted as the truer measure of advance, and the small country of Belgium could, it was significant, stand this particular test as favourably as her large neighbour who was afterwards to become her tyrannical despoiler.

In his successive chapters Professor Bellet notes and appraises the different factors which have, in his opinion, contributed to German success. The growth of population has been one of these, and it is noticeable that emigration, once considerable in volume, has almost ceased of recent years. Cheapness of production and of transport is another. The fostering of what are called instructively "indirect colonies" has been more instrumental than direct colonization which has in truth yielded meagre returns. But profitable markets have been secured by adroit and zealous agents, who, creating a demand, have helped the development of the home industries that, by the additional employment they have given, have removed the need for the departure to foreign countries of intending workers. Technical and professional instruction, scientific progress offering continually its services which are freely used in industry, economy in manufacture wrought by automatic machinery, by the constant dexterous disposal of waste-products, by standardization and interchangeable parts, and above all by production on a larger scale, have each fulfilled a part. The sale of the goods thus manufactured has been no less competently and profitably managed. An intimate contact has been established with the customer, whose smallest caprice was diligently studied and whose convenience was aptly consulted by the lavish grant of easy credit facilities. But, while these and other similar expedients may well receive that sincerest form of flattery which consists in imitation, Professor Bellet declares that the expansion of German trade has latterly been wrought "per fas et nefas," and he shares M. Millioud's view, expressed in the remarkable book on the "dominant caste" of Germany, from which he often quotes, that the commercial magnates were driven to seek war because the need of ceaseless expansion had become imperative. They could only avoid disaster by finding new opportunity for the continued use of previous unsound or illegitimate business practices. This part of their policy should, it is clear, not be copied. L.L.P.

12.—*La Grèce Économique et Financière.* Par H. Lefeuvre-Méaulle. Avec Préface de Paul Deschanel. x + 258 pp., 8vo. Paris: Félix Alcan, 1916. Price 3 fr. 50 c.

This work of a French commercial attaché in the East is commended in a brief preface by M. Deschanel as a favourable specimen of the useful office discharged by such representatives of their country in foreign lands. "The entire world," he says, "has "its eyes fixed on Greece," and M. Lefeuvre-Méaulle furnishes opportunely a study, "well-documented," on that country. Unfortunately, as the author himself informs us, official statistics end with 1912, and only relate to the old continental area of the kingdom. For the insular portions of the ancient country prior to the additions made after the treaty of Bucharest such knowledge as is forthcoming depends on the voluntary enterprise of private individuals. Candia and the new Macedonian provinces have independent figures, partly Turkish and partly Greek. In the absence then of complete authoritative data the author has had recourse to personal investigation, and to knowledge gained thereby in financial and commercial circles; and he has properly refrained from massing into totals figures thus secured.

Seven of his ten chapters are given to older continental Greece. Agriculture, such little other industry as yet exists, either derived from the products of the surface of the land or from the mineral contents beneath the soil, commerce, the customs arrangements and the mercantile marine, the means of communication, public and private finance, are the topics treated successively, for which the numerical data available are supplied. A chapter follows on the islands, another is added on the military organisation, and a concluding chapter is devoted to the Balkan War and the new acquisitions. Throughout the book, as we should expect, the present and prospective interests of France are kept in view; but the conspectus afforded will, we think, be of service to students in other countries; and, as M. Deschanel reproachfully remarks, France now occupies but a fifth place in Greek commerce, although he anticipates that after the War the French may "play" in the Orient "the part" assigned them by "tradition" and by "history." That Greece is mainly an agricultural country, that the Greeks have shown great aptitude for trade, that their finances are in no roseate condition, and that the burden entailed by excessive debt is heavy, are points brought out in this fresh survey which will not cause surprise to previous inquirers. L.L.P.

13.—*Readings in the Economic History of the United States.* By Ernest Ludlow Bogart, Ph.D., and Charles Manfred Thompson, Ph.D. xxvii + 862 pp., 8vo. New York: Longmans, Green and Co., 1916. Price 12*s.* 6*d.* net.

An Introduction to the Study of Organized Labour in America. By George Gorham Groat, Ph.D. xv + 494 pp., 8vo. New York: The Macmillan Co., 1916.

The study of original authorities as an instrument of education is now strongly recommended in many quarters; and, if the favoured method is not pushed so far as to become a fetish, or used ineptly for pupils insufficiently equipped by natural ability or by previous training to handle the masses of matter thus placed before them, it possesses certain manifest advantages. A close contact with real fact steadies the mind; and it may correct the distortion due to prejudice or prepossession. And, if it be opinion which is thus collected and presented, it is not unlikely to stimulate more interest if we listen to the actual utterances of the living or the dead than if we have to be content with their interpretation through the medium, more or less imperfect, of someone else's criticism or approval. Nevertheless the business of selection and arrangement needs experienced skill, and it demands as it rewards wise discrimination, while hints prefixed or commentary appended are usually by no means otiose. The teacher's function is not therefore superseded.

Of the two American publications now before us both may be said to be obviously prompted by the notion of an intimacy to be established between their readers and the concrete facts and first-hand opinion. Professor Groat states in his Preface that his "purpose "has been to start the study of the organized labour movement, "not to conclude it." "Many opinions," he says, "have been "stated" in his book: "opinions of those entitled to speak with "some authority on both sides of disputed issues. To these have "been added the author's views scattered through the discussion." Of the value of both, however, "the reader will judge for himself "after giving all sides a hearing," and it has been the writer's object to assist him to a "comprehension of what the organized labour "movement is." Accordingly it is first "seen against its back-"ground." To a history of the past and a picture of the present industrial setting succeeds a detailed description of "current forms "of association" taken as types. In Part III, under the heading of "collective bargaining," the industrial activities of the American Unions are examined, while the following part deals similarly with their "political activities." Possible or probable tendencies then receive attention in a fifth part entitled "transitional stages"; and in the sixth and final part some concluding general observations are put forward.

Considerable as is the place which the movement thus surveyed has taken, and will occupy, in the United States, it forms of course only one of the many subjects treated in the more comprehensive work attempted by Dr. Bogart and Dr. Thompson. Dr. Groat is, no doubt, right in his view that the "problems of labour constitute "one of the most serious issues" of American "social and industrial "life," and that they "centre in labour organizations." Such problems are not inconspicuous in the other book. But in the numerous documents collected and arranged by its compilers all species of the various economic activities of the great Transatlantic community, from the early days of "exploitation and colonization" between 1583 and 1773 to the later "economic progress" accomplished between 1860 and 1915 are illustrated. Agriculture, Industry and Trade, Labour, Exchange and Population between 1607 and 1763, English Colonial Theory and Policy from 1651 to 1763, American Commerce and Commercial Policy from 1783 to 1812, the Introduction of Manufactures and the Condition of the

People, 1775–1816, the Development of Manufactures from 1800 to 1860, the Tariff from 1808 to 1860, the Westward Movement from 1817 to 1860, Currency, Banking and State Debts from 1791 to 1860, Slavery and the South from 1823 to 1860, the Development of Agriculture from 1860 to 1915, Commerce, Transportation and Communication, Financial History, Money and Banking, Manufactures, the Tariff and Trusts, Population and Labour, and Economic Progress, during the same period, are among the headings of the successive chapters. Their bare enumeration will serve to show the size of the area embraced, the division of time which is generally followed, and the measure of importance given to different ages and topics.

To the period from 1600 to 1808 about a quarter of the total space has been devoted, that from 1808 to 1860 occupies one half, and the time which has elapsed since the Civil War fills the remaining quarter. "With only one or two exceptions," we are told, "the "material has been drawn from contemporary sources." But, while in the later periods official documents have grown in number, and have been more largely used, they have throughout been "supplemented by the more human and the more illuminating "comments of travellers, observers, and others, who were entitled "to speak authoritatively." In "controversial matters" "every "effort has been made to present both sides fairly." As the authors remark, it is truly a "panoramic picture" which is unfolded in their book; and it would be impossible here to attempt detailed inspection. So far as we can judge, due proportion has been preserved; and the material is as representative as it is interesting. The grouping within the separate chapters seems as appropriate as is the general scheme of arrangement, and the explanatory remarks which are inserted appear to combine the merit of terse brevity with the opportune supply of sufficient aid to an intelligent understanding. But obviously the book will be most profitably employed when a teacher is at hand to help the student with warning or encouragement.

Professor Groat's object, as we have observed, is more narrowly circumscribed But he, too, has necessarily to make a selection from the large amount of various material available for his use. He admits that, if a bias on his part be manifest, it is towards trade unionism; but that inclination, he adds, may be regarded as a corrective of a popular tendency in an opposite direction. The marked development of labour organization he traces, in his historical review, to the period following the Civil War, and, while the rise of prices was a promoting influence, the more fundamental reason can be discovered in the increasing difficulty with which the workmen could achieve the passage from their own ranks to the status of employers. Dealing with the "structure" of trade unionism, he contrasts the failure of the Knights of Labour, based as that body was on the conception of the needs and interests of labour as a whole and directed to political agitation, with the success of the American

Federation of labour, built on a continuing recognition of the separate nature of distinctive trades and rigorously excluding politics. From the statistics forthcoming it would seem that in 1913 the trade unionists in America, including the United States and Canada, were about two and three-quarter millions, and of these the American Federation in 1914 claimed a membership of some two millions. Dr. Groat examines with care the various shapes which "collective "bargaining" may assume; and he passes judgment on their merits and defects. Nor is he less instructive in his commentary on those "demarcation disputes" and that "revolutionary "syndicalism" which have latterly made a prominent appearance on the industrial stage in his country as in others. But, while admittedly he regards labour organization with hope rather than suspicion, and believes that unionism has "come to stay," he tries to acquaint his readers with the real facts established, and to inform them of opinions actually expressed by different persons of knowledge and influence on the various debatable points considered. For this reason, accordingly, the wide conspectus so furnished may, together with the other volume noticed in this review, be suitably characterized as "introducing" students to original authorities. Both are examples of a kind of economic literature which is fast growing in its bulk; and they will not, we believe, lower, but, on the contrary, they should raise, the standard of the quality attained.

L.L.P.

14.—*Poverty and Social Progress.* By Maurice Parmelee, Ph.D. xv + 477 pp., fcap. 8vo. New York: The Macmillan Co., 1916. Price 7*s*. 6*d*. net.

The author, who is assistant professor of political science in the college of the city of New York, claims to have endeavoured to give a comprehensive survey of the problems of poverty, which shows the one-sided character of many of the explanations of its causation, and furnishes the starting point for an effective programme of prevention. In two introductory chapters, he defines the organization of society, and describes what he terms pathological social conditions. In the first half of the book he studies the causes and conditions of poverty; and in the second half the methods by which the evils of existing poverty may be remedied, and those by which in future poverty can be prevented. He points out correctly that poverty is a vague term because it is relative. For the purpose of the abolition of poverty as a pathological social condition, he develops the conception of a society inspired by humanitarian and democratic ideals, which would establish standards of living and efficiency that would make poverty impossible. He agrees that this ideal might seem no better than a dream, and that if it were realized, there would still be enough and to spare of human misery. He is on safe ground when he insists upon the application of accurate scientific knowledge to the problem. There the Royal Statistical Society will be with him, for that is the purpose of its existence.

Dr. Parmelee thinks it necessary to the ascertainment of the causes of poverty that he should discuss the theory of the inheritance of acquired characters and the pathology of the body and of the mind. He describes all phases of mental infirmity, from feeble-mindedness to acute insanity, but these are not so much causes of poverty as of inability to undertake the responsibilities of citizenship. All civilized countries agree that it is within the province of the State to take charge of persons in that condition.

After disposing of this branch of his subject, he deals with that which is more closely relevant: the distribution of wealth and of incomes. He admits that it is difficult to arrive at an accurate estimate of that distribution; but suggests that an approximation is of value for his purpose. After an interesting summary of the various approximate estimates that have been made in the United States during the last twenty years, he arrives at the conclusion that wealth is becoming more and more concentrated, and that labour is not keeping up with capital in getting its share of the product. Comparing the condition of the wage earner in this country with that in the United States, he shows that wages here (and by consequence in other parts of the world) are lower than there. Arguing from this that the real incomes of American labourers are higher than those of English labourers, he thinks that the periods of poverty are not so strongly accentuated with them as with us: but still that, owing to the smallness of incomes, the capacity of a large number of people to spend is very small, and that this indicates an inequality in the distribution of wealth.

He proceeds to consider unemployment, its causes and its evil results. The causes within the individual are mental and physical defects, sickness and accident. Those outside him are seasonal changes, casual occupations, industrial warfare, and the like. The evils are loss of income, anxiety and worry, deterioration through idleness, pauperism and the waste of the productive power. The sweating system, with its low wages, its long hours and its insanitary conditions, is another evil of the present industrial system. Other conditions of labour which he considers to be causes of poverty are overwork and the labour of women and children and of unsuitable male adults.

In the part of his book which deals with remedial and preventive measures, he finds the humanitarian spirit at work in many movements, and also that religion and charity have frequently worked together for the suppression and the degradation of the working classes. Philanthropy, whether public or private, can have no material effort in lessening the amount of poverty. He thinks that little can be safely done in the way of eugenic regulation, because of our lack of knowledge. With regard to thrift, he holds that the arguments against it are not valid, but suggests that the most economical form of thrift for the working class is not accumulation but insurance. Reviewing the various forms of insurance and of pension provision, he cannot regard them as an important prophylactic against poverty. He thus discusses all ameliorating influences and finds them insufficient. He holds that poverty can only be removed by changing the distribution of wealth.

His constructive remedy is "to organize society upon the basis "of an industrial democracy." This may be done in two ways; the existing organization of industry upon private enterprise might be retained, with a sufficient governmental regulation to guarantee all citizens minimum living conditions and thus abolish poverty: or, socialism or some other form of collectivism might be substituted for that organization. To secure any success under the first method, it is obviously necessary that governmental efficiency should be increased. Dr. Parmelee admits that the government of the United States "has in many ways been inefficient and frequently corrupt." That any possible government might be efficient enough and pure enough to be trusted with such functions as those proposed seems doubtful. The pressure of circumstances and the conditions of war have clothed the government of this country with powers such as have never before been heard of or exercised here: but no one can wish that these powers should be continued after the emergency is over. Dr. Parmelee's theories will not, we think, bear the test of experience: but we may compliment him on having produced a valuable work, containing much material for thought. E.B.

15.—*Report on the Pension Funds of the City of New York.* Part I. *Operation of the Nine Existing Pension Funds.* 171 pp. Part II. *An Actuarial Investigation of the Mortality and Service Experience of the Special and General Service Funds for Municipal Employees.* 422 pp. Commission on Pensions, City of New York, 1916.

In the first volume the history of the various pension funds for municipal employees in the City of New York is traced. In the development of these plans, the initiative was taken by those immediately to be benefited, the city government apparently maintaining an attitude of indifference; the consequence has been a lack of uniformity in the different systems and in some cases unsound or extravagant methods of superannuation. For instance, while a majority of the city's employees have the privileges of retirement after twenty–thirty years' service without proof of disability, retirement on proof of disability after short periods, and pensions for their dependents, this is not the case of a large minority. The latter must furnish proof of incapacitating disability even after thirty years' service. 44,454 employees in active service fall into the former, 32,856 into the latter class.

Attention is also directed to the illogical and inequitable character of various existing benefit provisions. For instance, a policeman must wait until he has completed twenty-five years of service and has reached the age of fifty-five before he is entitled to optional retirement with a pension of half his final salary. But a service of only twenty years, without age limitation, puts the same amount of pension within his reach if he is certified as disabled from the performance of duty. In the fire and street cleaning departments, the same pension is payable after ten years' service in the case of disablement as would be earned by twenty years' service in the ordinary course. These provisions no doubt explain the high percentage of disability-pensioners on the rolls of the funds in question.

There are also opportunities for the exercise of favouritism. Thus, the language of the statute that pensions payable under certain provisions shall be " not less than " one-half the employee's terminal salary has been interpreted in some departments, but not in others, as creating a discretionary right to grant excess pensions. " An inquiry into the records of the twenty-six employees " retired from the fire department leads to the conclusion that " with few exceptions official discretion was based on considerations " other than those of extraordinary injury or merit." For instance, of 26 excess pensioners, only 4 were firemen, the remainder being higher officials whose pensions at half-pay should have been ample to maintain them in comfortable circumstances. A chief of the department was retired in good health at the age of 48 on a pension of 60 per cent. of his salary, while a deputy-chief retired at the age of 45 with 75 per cent. of his salary.

An instance is given of an official whose salary was raised from $2,100 to $3,000 during the year in which he was retired, and he then received a pension of $1,800.

These and similar facts prepare the reader for the results of the actuarial investigation contained in the second volume of the Report. The methods of analysis adopted by the actuaries do not call for any extended comment. Unadjusted rates were calculated from exposure tables " where the exposure was of sufficient magnitude " to give satisfactory results." When this was not the case—we do not know exactly what criterion was adopted as to whether any given exposure was or was not sufficient to give satisfactory results—the data were combined in five-year groups and unadjusted rates for the central years computed. In graduation, the graphic method was employed throughout.

The financial results are these. The present liability of the existing funds is no less than $215,520,413. The assets are $3,849,653 in hand and $8,895,192 representing prospective receipts from contributors, leaving a deficit of $202,775,568 to be met by the city by way of indirect contributions and out of appropriations from tax levy funds.

The Report raises a large number of questions of domestic importance to the citizens of New York upon which we have no desire to enlarge. Nor is it possible, within the limits of a review, to examine in detail the actuarial work, which reflects much credit upon Mr. George B. Buck and his staff. But, in view of the great practical importance of pension schemes in this country at the present time, the attention of those likely to be concerned in drawing up proposals should be directed to these volumes, which contain a mass of useful information. M.G.

16.—*O povo Portugez. Aspectos sociaes e economicos.* By Bento Carqueja, Professor of the University of Oporto. Lello and Trinao, 144 Rua das Carmelitas, Oporto, 1916. Price $1.60.

Professor Carqueja, the author of a number of works, social and political, is a Portuguese patriot who, with a vivid recollection of the glorious past of our oldest ally, is concerned as to the present condition of his nation and its future prospects. The work under review is a social, economic and vital presentment of the Portuguese as they are—too wide in its scope to be deep, but presenting matter of considerable interest and value to the student of social, economic and vital statistics. In his five hundred odd pages he treats of the life of his people under such varied aspects as racial characteristics, biological, social and family conditions, structure of the population and its vitality, fecundity and mortality, occupation, mentality, urbanisation, emigration and human capital His volume is the more welcome as in the statistical field Portugal is, up to the present, but ill-represented. The mere list of the authorities cited shows that the Professor has made a wide and extended study of his subject, but it is open to question whether he has exercised a wise discrimination in accepting all the theories and statements as sound which he appears to have done. For example, he quotes Bertillon's quite unfounded statement that faulty birth registration in England would if corrected reduce infant mortality by 43 per cent. and appears to accept the statement without question. Moreover, he is quite capable of falling into the elementary *post hoc ergo propter hoc* fallacy. Dealing with the question of the import duties on corn in Portugal he comes definitely to the conclusion that these must be lowered, but points to the increase in emigration from Ireland which followed on the repeal of the Corn Laws as a warning against expecting such a fiscal reform as lowering corn duties to solve the problem of emigration in Portugal. In the domain of statistics, which after all is our main concern for the moment, Professor Carqueja is not, it must be confessed, a reliable guide. His worst fault is the setting forth of comparative international tables which are not fairly comparable. Thus on page 287 he has a table of mortality by sexes headed by "Portugal (1909–13)." The obvious inference is that the figures relating to the other countries refer to the same period, but this is not the case. For England and Wales the rates are given as, males, 17·9; females, 15·7; persons, 16·8. As a matter of fact, the rates for the period 1909–13 for England and Wales were: males, 14·9; females, 13·14; persons, 13·95! Our author's notes relate to the period 1902–6 as far as England and Wales are concerned, but there is nothing in his table or text to warn us that this is the case. Again, on pages 298–9 he gives us the rate of infantile mortality for Portugal for the period 1902–1 as being 138 per 1,000 births, and compares it with figures for other countries. These are, for the same period, invariably wrong. England and Wales 147 instead of 137, Spain 191 instead of 172, Italy 190 instead of 168, France 168 instead of 139, Belgium 162 instead of 150. It would, indeed, be easy to multiply these instances, but these will suffice. In the statistics relating to Portugal itself there are one or two quite inexplicable errors. Thus, on page 169 the percentage of births of illegitimate children is calculated for the period 1906–10 as being 3·5 per 1,000 inhabitants and 0·32 per 100 births. Yet the figures given in the section on fecundity, only two pages later, show that the illegitimate births in the period in question accounted for 12·0 per cent. of the total births!

These blemishes notwithstanding, the work is, as has already been said, of considerable interest and value, for it is a courageous attempt to put forward a true picture of the social, economic and vital conditions of Portugal. The author recognizes that in some important respects his country is among the most backward of the western nations, and does not hesitate to say so, although, as in duty bound, he makes out the best case he can for his country.

Want of education is undoubtedly the worst of the evils from which Portugal suffers. As far as statistics show more than two-thirds of the total population can neither read nor write. In at least nine districts, Beja, Bragança, Evora, Faro, Guarda, Leiria, Portalegre, Vizeu and Castello Branca the percentage of analphabetics exceeds 80, in the last named it is as high as 84·42. Of course, these proportions include infants, but apart from these the figures are appallingly high. The percentage of women in 1914 who were unable to sign the marriage register was 70·0, of men 48·2. In 1915, among the permanent rank and file of the engineers 43 per cent. were analphabetics, and 17 per cent. could only read and write very badly. Taking the country district by district there is none in which the illiterates are less than 57 per cent. among males or 62 per cent. among females, while the maximum is 82 per cent. for males and 90 per cent. for females. Perhaps an even more melancholy feature is the paucity of progress that has been made in this respect of recent years. More schools and better paid teachers says our author, and with this we are in entire accord, for it appears that outside the principal towns a teacher of the third grade receives a salary of 160 escudos or about 35*l.*!

As far as the vital and demographic statistics may be relied upon, they show Portugal to be a country with high birth- and death-rates, a rate of natural increase in excess of most European countries and heavy emigration. Apparently the birth-rate in Portugal is not declining, for the rates for the most recent years by triennial periods are :—

1902–04 ...	31·9 per 1,000 living	1908–10 ...	30·3 per 1,000 living
1905–07 ...	31·2 ,,	1911–13 ...	35·4 ,,

It is, of course, possible that more efficient registration may account in some measure for the great increase in the last period. For the same periods the death-rates were :—

1902–04 ...	19·2 per 1,000 living	1908–10 ...	19·3 per 1,000 living
1905–07 ...	20·2 ,,	1911–13 ...	20·9 ,,

The natural increase by excess of births over deaths has, therefore, varied between 11·0 and 14·5 per 1,000 living, the rate of natural increase during the last of these periods being considerably in excess of our own or any other western European country except the Netherlands. The ugly feature of the Portuguese figures is the persistence of the very high death-rate. Thus, in the interval between the first and last periods shown there has been a persistent fall in the death-rate in other countries, in the Netherlands 16 per cent., in Germany 15 per cent., in the United Kingdom 12 per cent., in Italy 10 per cent., while in Portugal there is a rise of 9 per cent. Infantile mortality is not unduly high, but child mortality apparently is.

Portugal has a fairly high preponderance of male over female births, something over 1,070 to 1,000, and the difference in sex mortality is not so marked as in England. This notwithstanding, the population of Portugal contains a higher proportion of females than any other European country. According to the results of the census of 1911, the proportion of females to males in the population was 1,104 to 1,000, as against 1,069 in Norway and 1,067 in England. Up to the age of 20 there is a slight excess of males, but after that age the excess of females is at least 20 per cent. Emigration is the main cause of this sex disparity. This shows a very marked and notable increase of recent years, and our author gives the increase by index numbers since 1886 as follows :—

1886 ...	100	1896 ...	187	1906 ...	243	1913....	481

In the district of Bragança the emigration for the triennium 1911–13 reached the average of 8,675 annually, equal to a proportion of 45·17 per 1,000 inhabitants. There is a heavy excess of male emigration, especially of adults. The average annual emigration for 1909–14 is given as males over 14, 31,412 ; females over 14, 8,057 ; males under 14, 6,166 ; females under 14, 3,657. The bulk of the emigration is to Brazil, though this has been slightly diminished of recent years. In the triennium 1896–8, Brazil claimed 85 per cent. of the emigrants and the Portuguese possessions in Africa 6 per cent.—but in 1911–12 Brazil had 81 per cent. and North America 15 per cent.

It is impossible within the limits of a brief review to discuss the many problems raised by Professor Carqueja, or even to touch on the other social, political and economic points with which he has dealt. He is clearly impressed with a sense of the defects in the body social, politic and economic of his country, and is convinced that much can be remedied and that Portugal can support a much larger population in happier circumstances, and we are not disinclined to share his hopes. He has some excellent suggestions as to the improvements to be effected in vital statistics in Portugal, which, if carried out, would certainly be a great step toward affording that accurate basis for investigation which is the first essential toward melioration. His volume contains a number of useful diagrams and graphs, and one may be especially grateful to him for furnishing a table of Portuguese survivorship for the years 1900–13. There is probably a liberal margin of error in the very high ages, for Portugal, like Ireland, seems to suffer from overstatement of the ages of very old people. The census of 1911 gave 395 centenarians out of a population of under six millions. The oldest of these we were informed was a widow of 120, who though enjoying reasonable health had been incapacitated from work for the last two years by blindness. On the other hand, a youth of 110 with ten sons was still working. Evidently Portugal is the country for us when we are getting into the sere and yellow. S. de J.

17.—*Losses of Life in Modern Wars: Austria-Hungary, France.* By Gaston Bodart, LL.D. *Military Selection and Race Deterioration.* By Vernon Lyman Kellogg. Edited by Harald Westergaard. (A publication of the Carnegie Endowment for International Peace.) x + 207 pp., 8vo. Oxford: At the Clarendon Press, 1916. Price 6*s.* net.

The first part of this volume is a careful statistical study of the estimated losses in action among the troops of Austria-Hungary and of France in the various wars in which these powers have been involved since the beginning of the seventeenth century. The data, particularly in the case of the earlier wars, are often inaccurate, but Dr. Bodart has evidently taken pains to arrive at as good an approximation to the truth as can be reached. As he points out, the losses among officers which are reported much more accurately than those of the rank and file often provide a useful check. He finds that in several armies the relative losses of officers and men have not varied through one hundred and fifty years and, assuming this constant ratio, he suggests that the total losses of the French armies during the Revolutionary and Napoleonic periods were often much greater than stated in the bulletins. Dr. Bodart also deals with naval losses, both of *personnel* and material, and these particulars are of special interest to English readers. At the battle of La Hougue, which Dr. Bodart states to have been the greatest naval action of modern times, the English and Dutch fleet consisted of 99 ships of the line and 19 frigates carrying 6,756 guns and 40,000 men. The French forces were about half as numerous and their losses were 25 per cent. of the *personnel* and 38 per cent. of the ships.

In the naval war between 1778–83, Great Britain lost 3 ships of the line captured and 17 destroyed, while 47 of her frigates were destroyed and 23 captured. The losses in frigates of the powers allied against Great Britain were rather fewer, 68, but they lost 31 ships of the line. The losses of men are unknown except in the case of great battles; in these the English lost about 6,000 and the French not less than 10,000 exclusive of unwounded prisoners. The mercantile losses of England were, for obvious reasons, heavier than those of her adversaries, viz., 2,200 merchant vessels and 75 privateers, against 1,100 merchant vessels and 215 privateers.

The naval war between 1793 and 1802 cost Great Britain 26 ships of the line and 55 frigates, her enemies lost 96 ships of the line and 219 frigates.

Between 1803 and 1815, England captured from her foes 39 ships of the line and 113 frigates carrying 5,382 guns and about 50,000 men. She lost one ship of the line and 14 frigates carrying 496 guns and about 4,000 men. In smaller war vessels her losses were greater, viz., 70 sunk, wrecked or destroyed as compared with 75 enemy vessels similarly accounted for. Two tables are given of the losses of French naval officers, but the totals do not agree exactly. According to the figures on p. 135, 484 were killed and 993 wounded.

The concluding pages of the volume are devoted to an essay by Mr. V. L. Kellogg on Military Selection and Race Deterioration. Mr. Kellogg writes clearly, but does not throw any new light upon the subject; he has, however, made a useful digest of the evidence derived from recruiting statistics which is thought to demonstrate racial degeneration in France as a consequence of the Napoleonic wars. M.G.

18.—*Epidemics Resulting from Wars.* By Dr. Friedrich Prinzing, edited by Harald Westergaard. (A publication of the Carnegie Endowment for International Peace.) ix + 340 pp., 8vo. Oxford: At the Clarendon Press, 1916. Price 7*s.* 6*d.* net.

The subject entrusted to Dr. Prinzing by the Director of the Economics Section of the Carnegie Endowment for International Peace, viz., the effects of pestilences, arising out of or associated with war, upon the civil populations, is one of painful interest at the present time. The author capable of rising to the height of so great an argument would need to be endowed with qualities of a high order and rarely found in combination. He should not only possess a forceful literary style but a wide familiarity with epidemiological and clinical medicine and a knowledge of statistical methods.

Dr. Prinzing is favourably known to English statisticians as the author of a handbook of Medical Statistics which, although displaying no knowledge of modern statistical methods, brings together much useful and scattered material and forms a handy work of reference. The qualities shown in the former work have gone to the compilation of the present volume, and give it such value as it possesses.

Dr. Prinzing appears to have had only a limited amount of time at his disposal, and he accordingly abstained from an attempt to prepare a complete history of war pestilences and concentrated his efforts upon certain epochs. The period before the Thirty Years' War is dealt with in a few pages, but the Thirty Years' War itself is examined in some detail, the author following closely a monograph published by Lammert in 1890; thereafter the account is more copious, the bulk of the space being devoted to the great typhus outbreaks following the Russian Campaign of Napoleon in 1812, and to the pandemic of small pox which was ushered in by the Franco-German War of 1870–71.

Dr. Prinzing's account of the outbreak of small pox in Germany in 1871–2 is much the most valuable section of his book. The facts of this epidemic, which cost Germany more than 170,000 lives, are of course sufficiently familiar, but details are scattered through many official and unofficial publications and it is very convenient to have all the available statistics collected together. Dr. Prinzing has performed this task admirably and any statistician who wishes to fit curves to epidemic distributions will find a large supply of appropriate data.

Praise is also due to the account of war typhus in the Napoleonic epoch. The author does not add any new facts of importance to the description contained in Haeser's well-known *Lehrbuch*, but the latter work has never been translated into English. For similar reasons Dr. Prinzing's story of the sieges of Paris and of Port Arthur is valuable; no equally useful account is to be found in English.

It is to be regretted that similar praise cannot be given to the rest of Dr. Prinzing's book. His acquaintance with epidemiological literature seems to be slight (no use has been made of the standard works of Creighton and Sticker), and his statements respecting well-ascertained matters of facts are often untrustworthy. Thus, the assertion that bacillary dysentery is caused "by the *bacillus* "*pyocyaneus* discovered independently by Stiga (*sic*), Kruse and "Flexner" (p. 7) is entirely incorrect. The *bacillus pyocyaneus* is not the cause of bacillary dysentery, nor was it discovered by Shiga, Kruse and Flexner. Similarly the statements that bubonic plague may be conveyed directly from person to person, that the faeces of rats are an immediate source of danger, and that the blood and excretions of persons suffering from plague contain bacilli in abundance, are quite without foundation. Indeed, nearly all Dr. Prinzing's general observations in the first chapter of his book are either incorrect or contain those partial truths that are likely to mislead a non-medical reader.

In an introductory note written at the instance of the authorities of the Carnegie Endowment, it is stated that "The standing and "attainments of the writers selected afford a guarantee of thorough-"ness of research and accuracy in the statement of facts." We cannot honestly say that the contents of Dr. Prinzing's book suggest that the guarantee is a very solid one. M.G.

19.—*The Economic Life of a Bengal District. A study.* By J. C. Jack, of the Indian Civil Service, and temporarily of the Royal Field Artillery. 176 pp., 8vo. Oxford: Clarendon Press, 1916. Price 7*s*. 6*d*. net.

The object of this study is to give readers in England an insight into the way of life of the people in a corner of British India, and from the economic side thereof to form a judgment upon the condition of those under our rule there. The author was in a position to collect statistics of domestic life in a detail and on a scale never before undertaken, and he has here summarized them in a shape in which they can be easily and pleasurably assimilated, with a special eye to a public not conversant with Indian conditions. To readers of this class, the life described will present astounding novelties, and a good deal of it, indeed, lies wholly outside the experience of those who know only other parts of the country.

The largest and most prospering portions of this tract are under water for eight months of the year. The population is found chiefly on mounds thrown up round ponds dug for use between flood-times. Every house has its boat, and fishing-tackle garnishes the corners of its principal rooms. But though fish is generally and largely eaten, the staple food is rice. The four months of dry land allow of a harvest which suffices for the whole population. The latter, it may be noted, is packed on the land to the tune of more than 820 to the mile. Three-fourths of them also live by it and thrive, withal, for not only are they increasing in number but, according to the statistics here given, one-half of them are returned as in circumstances rather more than easy, and only a little above 4 per cent. are on the margin of subsistence. There are no landless field labourers, and every homestead is owned, not rented, by its occupant. The standard of income is not high, as the peasant family is here passing rich on just half the sum assigned by Goldsmith to that blissful state, while a family of five is just able to live on 7*l*. 13*s*. 4*d*. a year. Nor is the indebtedness other than light—for India, and it is confined to less than half the families investigated. Finally, a sum of 18*s*. 5¼*d*. covers the rates and taxes, direct and indirect, for the year, and falls at the rate of 8¾ per cent. upon the estimated income. All of which will be found set forth in the Tables, and explained in the text of this volume.

From the statistical standpoint, one of the main questions to present itself in connection with an inquiry of this sort is the relative extent to which that intrusive factor, the personal equation, is placated. The number of persons making the individual inquiries of which the results are here given was over 200, and more than 340,000 families were subjected to their domiciliary catechism. A good deal of the information, too, was admittedly such as could be based upon estimate only. There was abundant room, therefore, for personal judgment. On the other hand, the conditions generally seem to have been, on the whole, in favour of more than average uniformity of observation. The staff had been for some years engaged on the spot in circumstances which placed them in intimate touch with the occupational life of the people, and had given them experience in eliciting, checking and recording matters of domestic detail. The population, again, is remarkably homogeneous in class and occupation, so that special test inquiries conducted in different parts of the district produced almost identical results. Then in regard to all that relates to crops, rent and cultivation—that is, to more than three-fourths of the whole field of investigation—every statement could be checked from material which had just been collected by the same agency for an independent purpose. More important, perhaps, in relation to accuracy of record, is the judicious avoidance of a scheme of elaborate classification. Every family was held to belong to one of four general groups, intelligibly but not minutely, defined according to the scale of living. This comprehensiveness tends to eliminate the greater part of the uncertainty or bias natural to the exercise of the individual judgment upon the respective claims of the various sections of a minutely subdivided field. There should also be taken into consideration the simplicity of the life described and its striking uniformity, except at the two extremes of the community. The budget of the less well-to-do family contains the same items of expenditure as that of the more fortunate, the difference is that less is spent upon them. There must be due allowance made, too, for the saving grace of the large number of the individual observations, and, not least, the thorough knowledge of the people possessed by the author himself, and well indicated in the instructions and warnings drawn up by him for the guidance of his staff. The work may be generally described as the co-ordination of the results of a multitude of intensive observations into a statistical whole, an undertaking which closely approaches the ideal of social inquiry once commended before the Society by its late lamented President, Mr. Charles Booth. In one respect it even exceeds his aspirations, that is in the number of its units of investigation. Here, there is not the basis of a few carefully selected families, as in the work of Le Play, nor the more generous haphazard collection advocated by Dr. Kiaer, but every family in a population of nearly two millions. When the International Statistical Institute last met in Paris, M. de Foville charmed it with one of those acute and witty essays of which he was past master, on the Monograph in its relation to statistics, showing how the two methods, intensive and extended, produce the best fruit when combined. Extensive observations, in fact, yield the statistics which it is the privilege of the monograph to inspire with the fresh air of actual life. The work before us is a good example of this judicious blend. The author pleads undue haste in its preparation. It is, indeed, almost incredible that he could have done it in so short a time, nor could it have been so done by any one of less fullness of knowledge and enthusiasm. Omissions, such as they are, do not affect the general purport of the work, and the volume will be found most interesting and suggestive, not only to those to whom it is specially addressed, but to others, who being versed in Indian administrative problems, are better able to appreciate the difficulties surmounted, and the value and originality of the results. J.A.B.

20.—*The Population Problem in India.* By P. K. Wattal, M.A. iii + 83 pp., 8vo. Bombay: Bennett, Coleman and Co., 1916.

The population described by Mr. Jack in the volume reviewed above, though typical of a special tract only, presents some general features common to all India. Everywhere the great majority of the people live by cultivation or by occupations depending upon the fortunes of those who do. Everywhere marriage is as universal as it can be, and the women are married early. In the aggregate, therefore, the output of children is very large, though the high mortality, which always accompanies a high birth-rate, results in a net increase only moderate, inclined to slow, and is aided by the other positive checks, malaria, plague, and failure of crops from time to time. As the population is mostly vegetarian and self-supporting, the weight of the increase, such as it is, falls almost entirely upon the cultivable land, and in some of the more densely peopled tracts there are indications that the supporting powers of the soil are approaching their limit.

The author, who is well read in his authorities on the population question in general, and earnest in his desire to see counteracted some of the tendencies towards over-population which he discerns amongst his fellow countrymen, deals here, in the main, with two important factors in the situation. First, the increasing pressure upon the land, and, then, the inordinate waste of life involved in the natural increase of the population. He surveys a wide field of facts, well marshalled and clearly put. He is, however, the advocate of a sovereign remedy, and, as is not unusual in that position, in the anxiety to find room for its application, his diagnosis occasionally overlooks qualifications which go towards making the symptoms less urgently in need of drastic treatment. In appreciating the relation between population and cultivable land, not the mere area is to be taken into account, but the whole consensus of agricultural conditions, and the standard of living prevailing amongst the population in question. Of late years, improved methods of tillage have been making headway, new and lucrative crops have been introduced; the extension of railways enables a large body of harvesters to migrate from district to district, and of labourers to desert temporarily their villages for public works and the developing manufacturies of the towns, thus improving and supplementing the family resources. Then, again, the great rise in food prices, which presses hardly, no doubt, as the author remarks, upon the non-agricultural classes, has been a great gain to the agricultural majority. Nor does it harm the wage-earner, as the author, who judges only by the official "cash equivalent" returns, appears to think, because, as has been often explained in connection with those tables, comparatively few wages are on a cash basis, but are fixed, for the most part, upon the local price of the staple foods. In regard to his second point, the great waste of life involved in the growth of the population, there can be no doubt. Where almost every adult is or has been married, the birth-rate is enormous, and far beyond the official record. Then, as all the upper classes of Hindus, and in some of the most thickly peopled districts, the whole population, begin cohabitation as soon as the wife is capable of it, a heavy toll is levied by death upon both the immature mother and her premature offspring. Probably, too, the practice is not conducive to constitutional hardiness or longevity. It is a mistake, however, to cite the life-tables in evidence of a deterioration in viability as they are respectively framed on widely differing data, by different methods, and for different objects. Still less is it to the purpose in view to contrast the life values of the tropics, where nature yields a bare subsistence upon comparatively easy terms, with those of the temperate zone, where, in the north, the constitution is hardened by continuous struggle. Between different communities within India itself comparison is, of course, legitimate, and is here instituted in support of the Spencerian theory that "individuation and "reproduction are antagonistic," so that "fecundity is greater in "consequence of a lesser cerebral development." This is to explain the tendency, which the author deplores and would check, of the lower classes to outbreed the upper. But he is not happy in his instances. The hill tribes are the most prolific and least literate in India, and have the lowest proportion of old people, which last he attributes to over childbearing, as he does the first to low intellect. On the other side of the question, however, are the facts that their women only marry when of ripe age, and widows may remarry. The offspring, therefore, are produced under more normal conditions and survive in greater numbers. In the balance, therefore, their weight makes the old kick the beam, and amongst the latter, too, women predominate in number to a greater extent than amongst the more settled population. His second example, the Muslim community, is open to the same objection. Granting that they are less intellectual than the heterogeneous mass called Hindu, which is not true, they observe the same marriage practice as the Hill men, and breed only from matured brides, and can take the still more matured widow, if they like. Moreover, owing to a more generous dietary, they are hardier than their vegetarian compeers.

Be all this as it may, the one specific here prescribed for the overcrowding of the land, the waste of life amongst the young, and the undue increase of the unfit, is the repression of what Byron calls "that worst of vices—propagation." This cannot be effected in India by abstention from marriage, which for three-fourths of the population is a religious obligation, and is dictated among the rest by example and domestic necessity. Nor, again, would the postponement of cohabitation until the wife has reached maturity tend towards the object in view, for the highest proportion of children is found amongst the classes which already follow that practice. Salvation, then, is only to be found in "Neo-"Malthusianism." This cult usually starts in the upper classes, and from some passages in his book, as well as from the fact that he writes in English—and excellent English, too—it is evidently to them that he addresses his advice. But though he deplores the handicap of large families under which they suffer, the proportion of children among them is already by far the lowest in the country, and to reduce it further would only aggravate the other symptom he condemns, the growing preponderance of the illiterate. To have any substantial effect, then, in retarding the irregular increase of population, the voluntary restriction of births should begin, not at the top, but amongst the more prolific lower grades of society, and there, judging from experience in the West, it is too apt to take the form of procuring abortion. J.A.B.

21.—*Facts About Land. A Reply to "The Land," the Report of the Unofficial Land Enquiry Committee.* Prepared by The Land Agents' Society. xxi + 319 pp., 8vo. London: John Murray, 1916. Price 2*s.* 6*d.* net.

Reconstruction after the war is the hobby of the moment, and everyone considers he is capable of advising as to the alteration and reconstruction of rural conditions. Those who have a real knowledge of the practical details of farming and village life are just now too busy to be wire pulling. Those who farm well are not supposed to talk well, and those who talk are not always noted for good farming. There are just a few exceptions, but very few.

If agriculture is to be reconstructed through urban experts *Facts About Land* is the most recent text book, and the title seems justified. No one, however, should read *Facts About Land* until a complete study has been made of "The Land," the Report of the Land Enquiry Committee (Vol. 1 Rural) issued in 1913 or 1914. The Committee say at the outset of this report: "The general "purpose of the enquiry was to obtain an accurate and impartial "account of social and economic conditions in the rural parts of "Great Britain." The Council of the Land Agents' Society, who are responsible for *Facts About Land*, set two questions to the members of the Society:

(1) Does the report present a full and accurate review of the conditions of the agricultural industry in 1913?

(2) Are the remedies which it proposed calculated to promote the progress of agriculture and to improve the general position of agricultural labourers?

The Council reminds the readers of the book that "It is on the "practical side only that the Land Agents' Society either desires "to speak or possesses the technical knowledge to speak with any "authority. Its members manage thousands of acres in every "county in England and Wales as well as in many parts of Scotland." The Society is "unanimous in the opinion that the report of the "Land Enquiry Committee presents an inaccurate and partial "picture of agricultural conditions in 1913, and that the remedies "proposed in the report are calculated to deteriorate rather than "improve the general position of agricultural labourers, and will "check rather than promote the progress of agriculture."

It is the old case of defendant's counsel saying that plaintiff's case is all wrong, but there is no judge to decide in this instance between the two books except the public who read them. The public can see the two points of view. It can weigh up the bona fides and the arguments of the litigants and come to a conclusion.

From a statistical point of view the report of the Land Enquiry Committee is unreliable, and in *Facts About Land* we get for the first time a studied reply to the Report and based on definite enquiry throughout the country. It appears to have been compiled with care and accuracy. Mr. Marshall, the Secretary to the Land Agents' Society, is a solicitor and a member of a firm frequently engaged as Parliamentary Agents, who is fighting in France. His politics are an unknown quantity to any of his friends and he has a judicial mind. The previous publications of the Society have been remarked on for their lucidness and accuracy.

Both the enquiries and the Society suffer from want of up-to-date statistics, and this lessens the value most of the argument on the subject of wages. Not since 1907 have we had any real statistics as to wages of agricultural labourers, and it is much to be regretted that the Board of Trade did not send out in 1914 the excellent forms which were actually prepared, as we should then have had a true pre-war standard of wages. To base any arguments for either 1913 or 1917 on wages paid and received in 1907 is sheer waste of time.

The continual and progressive rise in agricultural wages for twenty years, and the record wages now being paid, make one think that high wages are not the millennium, and certainly have not produced the effect which the Land Enquiry report said would follow. No definite sum as a minimum wage was given in the report, but the tables on pp. 69–79 seem to hint at 18*s.*, 20*s.*, and 22*s.* 6*d.* per week. These sums are being paid now, and much more because men are scarce and profits from farming are better, and yet is the labourer better off to-day than before the war ? Is the land better farmed ?

It seems centuries ago since we used to argue about what seem to-day very trivial things, and it has been an uncongenial task to re-read the Land Enquiry Report and *Facts About Land*. We are thinking of bigger and better things, and yet there may come a time when we must again return to politics and then those two text books must be studied and the public must judge between them. What is to be feared is that one side will read only the Land Enquiry Report, and the other side only *Facts About Land*. Both should be studied together. *Audi alteram partem.* H.T.E.

22.—*British Forestry.* By E. P. Stebbing. xxii + 257 pp., 8vo. London : John Murray, 1916. Price 6*s.*

Once again the Government is being " advised " on the subject of forestry—this time by a sub-committee of the Re-construction Committee of the Cabinet—so that this volume appears very opportunely. Like all who have approached the subject with an open mind, Mr. Stebbing recognizes that a big move in forestry is only possible through direct State action. The returns of afforestation are too long deferred to attract the private planter. If that has been the case in the past, how much more so will it be true after the war. The best that can be hoped from private forestry is that the existing area of woodlands will not suffer serious shrinkage. But the afforestation of fresh land can appeal only to those with spare capital that they are prepared to spend on planting, just as others with surplus cash convert it into pictures, race horses, or some other form of luxury. In point of fact, the wooded area of the United Kingdom lost 37,000 acres between 1905 and 1913, and it may require legislative enactment to secure the replanting of all the woods that are being so freely felled at the present time.

Forestry and agriculture have alike suffered in the past from Government neglect. British timber equally with home-grown food has been sacrificed on the altar of "cheapness." And now, when it is realized that timber is a national requirement almost as important as food, the Government intervenes, but its first act of intervention is not to plant but to set up the Home Grown Timber Committee to fell trees that it refused to take any hand in planting.

Mr. Stebbing's volume is arranged in four sections. The first outlines a national planting scheme under which a large proportion of the 17 million acres that figure in the Agricultural Returns for Great Britain as "Mountain and Heath Land used for Grazing," and in those for Ireland as "Mountain Land," would be put under trees. He appears to have overlooked the fact that besides this land there are 3½ million acres in Scotland under deer forests, much of which is quite as suitable for afforestation as the hill pastures. The suggestion made in some quarters that afforestation on a large scale cannot be undertaken till men are trained for the work is mentioned only to be dismissed, and rightly so. The management of forests is a highly technical business, but anyone who can use a spade can soon be trusted to insert the plants. A slip seems to have been made in including Austrian pine amongst the four most important trees, Corsican pine being probably intended.

The second section deals with the forests of the Russian Empire. It is from these that it is hoped to draw the enormous supplies of timber that will be required to restore the devastated buildings of France and Belgium, and to meet British industrial requirements. Fortunately Russian forests have been much under-cut in the past, so that there is a vast reserve of timber to draw upon. Mr. Stebbing convincingly argues that the British Government should lease a large tract of Russian forest, and undertake the whole work of exploitation.

The statistics of our trade in foreign timber, before and during the war, furnish the theme of Part III. With serious shrinkage in imports of pitwood the price of this class of wood has trebled, and immature woods fit for colliery purposes are being cleared in this country as quickly as men can be found to fell them. In November, 1914, the Board of Agriculture estimated that we had nearly two years' supply of such growing timber, so that it would appear a substitute for the kind of pitwood hitherto employed must soon be found.

In the last section a case is made out for the employment of women in the lighter branches of forestry.

Many of the chapters have already appeared as articles in periodicals, so that there is almost necessarily a good deal of repetition throughout the book. But the work is one whose perusal can be recommended to all who desire to inform themselves of the present position of a subject of great national and economic importance. W.S.

23.—*Domestic Service. An Enquiry by the Women's Industrial Council.* Report by C. V. Butler, with a supplementary chapter by Lady Willoughby de Broke. 148 pp., 8vo. London: G. Bell and Sons, Ltd., 1916. Price 1*s.* 3*d.* net.

This very interesting report is based upon the replies received to a questionnaire sent by the Women's Industrial Council to employers and servants on the subject of domestic service. 708 employer's schedules and 566 servant's schedules were received duly filled in, and in addition many hundreds of letter from employers and workers. The report, which was practically concluded before the war, deals with the industry under normal conditions, and not, as at present, under abnormal conditions due to the demand for female labour in war trades.

The report draws a clear distinction between the personal and the industrial aspect of the question. It concludes that, so far as the personal aspect is concerned, the domestic servant is at a disadvantage, compared with other workers, as regards loss of liberty, lack of interests, lack of companionship and even loss of caste. As regards the more strictly industrial side of the question, the conclusions arrived at are less definite. Allowing for the value of board and lodging the wages paid to domestic servants compare favourably with those paid in other industries; but, on the other hand, the hours of labour are much longer. The majority of the servants filling up schedules had no definite free time during the working day which might last from 6.30 a.m. till 10 p.m. It is true they were not fully occupied all this time; but they might be summoned for duty at any moment. The "prospects" of service, as compared with other forms of wage earning for women, are considered good for the efficient servant while so occupied; but only moderately good for the wage-earner who, after marriage, has to become self-supporting once more. The evidence on which the latter conclusion is based is not convincing, and, in fact, the whole section dealing with "prospects" is much less satisfactory than the rest of the book. For example, a table is given showing that the number of applicants per place increases with the importance of the place, and also a series of figures showing that the number of domestic servants for the age group 25–35 is greater than for the age group 35–45 and still greater than for the age group 45–65. The report then states "These two sets of figures indicate: (*a*) that it is hard for the "middle-aged servant, even if efficient, to get good fresh employ-"ment, in which experience rather than physical freshness tells; "and (*b*) that the third or fourth-rate servant tends to get squeezed "out of service altogether in middle life." This may be true, but the figures given do not prove it.

The report is not very hopeful as to the part trade unions may play in improving the status and conditions of domestic service. It is pointed out that indoor servants are as hard to organize as home workers, and that there is the added difficulty of the industry being concerned in providing personal services. The particular difficulties of domestic service are well summed up in the following passage: " . . . . domestic service is, to some extent, an "anachronism. You cannot modernize industrial conditions "within it unless you transform these conditions completely. It "is not like other trades, because here, if you get rid of the capitalist, "you get rid of the industry."

This report is a valuable addition to the literature dealing with economic industrial conditions. F.W.

24.—*Memorandum on the Industrial Situation after the War.* By the Garton Foundation. 96 pp., 4to. London: Harrison and Sons, St. Martin's Lane, 1916. Price 1*s.* net.

Eclipse or Empire? By H. B. Gray and Samuel Turner. x + 316 pp., 8vo. London: Nisbet and Co., 1916. Price 2*s.* net.

This is Our Land; Problems of the War and Peace from the Point of View of a Business Man. By "Emporos." 130 pp., 8vo. London: Simpkin, Marshall, Hamilton Kent and Co., 1916. Price 2*s.* net.

The Garton Memorandum is stated to have been privately circulated among employers, representatives of labour and public men of all parties between May and September, 1916, and to be now published with the revision suggested by the comments received from these persons. It is the best and most level-headed of the many forecasts of the industrial situation yet published, steering clear alike of the absurd optimism of the majority which represents the war as the greatest blessing humanity has ever received, and the extreme pessimism of the small minority which disbelieves in the probability of healthy reaction. No better summary of the present situation could be made in a few words than the following:— "The prosperity of the present is artificial and transient. It is "due in part to strenuous exertion which cannot be continued "indefinitely; in part to sacrifices which go unrealized because "they are not proclaimed; in part to the depletion of accumulated "stocks; in part to the suspension of expenditure on national "plant, which, if continued, would end in dilapidation; in part "to the temporary absorption into industry of people who will "not continue to be producers after the war; in part to borrowing "and recalling money from abroad. It resembles in large measure "the lavishness of the spendthrift which leads to bankruptcy."

A careful balancing of the probable good and bad effects of the war leads to the conclusion that the national income is likely to be lower than before the war, and that quarrels over its distribution are likely to be greater. For the solution of the fundamental problem four guiding principles are laid down: (1) increased efficiency in production is necessary; (2) it must be sought for in better methods and organization and in a new attitude towards industry; (3) reforms can only be accomplished by the co-operation of labour, management and capital; and (4) in order to secure this co-operation, labour must have a voice in matters relating to its special interests. It is suggested that to carry out these principles boards of employers and employed should be formed both for individual businesses and whole trades—boards which would differ from the existing conciliation and arbitration machinery in that they would not be called in only after a dispute has arisen, but would obviate the outbreak of disputes by discussing action beforehand.

An appendix, for which Mr. A. E. Zimmern alone is responsible, works out in some detail a special scheme for the Post Office on similar lines.

It is to be hoped that the Memorandum will have a wide circulation among the persons immediately concerned, and set them on experiments in the direction indicated. Experiment only can decide the precise form of the machinery required to diminish the friction which obstructs progress.

Eclipse or Empire? is, as its title suggests, a rather frenzied appeal to the self-abasement mood in which the British mind is prone to find itself when things are not going as well as they might. Its opening sentence indicates its character—"Forty years ago "Great Britain was still the workshop of the world. To-day she "is not." The authors do not, any more than the economic historians who have made the phrase a hackneyed one, make any attempt to explain what a workshop of the world is. Presumably a workshop-country should be a country which makes things in workshops (including factories) and gets in exchange for them things which are not made in workshops, which would be chiefly agricultural products, and a workshop of the world would be a country which did all or nearly all the workshop work of the world while all the other countries were devoted to agriculture and other arts which do not require workshops. Yet our authors complain most violently that our agricultural produce is so small!

A large portion of the book is given up to "facts and figures" which "prove that a large percentage of the new ideas and inventions "which have been given to the world during the last forty years "have issued from nations other than our own." Truly the British mood of self-abasement is very near akin to insufferable conceit: the population of this country is two or three per cent. of that of the world, and its area is a still smaller percentage, and yet we are to make it a grievance against ourselves that all the other countries together give to the world (ourselves included) "a large percentage" of the new ideas and inventions which are made.

The author of *This is Our Land* says "I have endeavoured to "give expression to the feelings and ideas which, at this great crisis "in our history, I firmly believe dominate the minds of the great "mass of my fellow-countrymen." If we substitute "a great mass" for "the great mass," we shall have no hesitation in admitting his complete success. The book is a collection of what appear platitudes to the proverbial "man in the street" in his present ill-humour.

E.C.

25.—*The Hidden Scourge.* By Mary Scharlieb, M.S., M.D. 96 pp.

Cradles or Coffins? By James Marchant, F.R.S. Edin. 96 pp. National Life Series, Nos. 1 and 2. London: Published by C. Arthur Pearson, Ltd., 1916. Price 1*s.* net each.

These volumes are popular summaries, with comments, of the findings of the Royal Commission on Venereal Diseases and of the Birth-Rate Commission respectively, and each is accompanied by an episcopal benediction. Each provides a reasonably full summary of the facts and the commentaries are sufficient for the purpose. As might have been expected, Dr. Scharlieb approximates to the ideal of objectivity more closely than does Mr. Marchant, whose literary style is reminiscent of the daily press, but we have not detected any important errors of fact in the latter's brochure.

M.G.

26.—*Other New Publications.**

Akesson (*O. A.*). On the Dissection of Correlation Surfaces. 18 pp., sm. 8vo. Stockholm: Lund University, 1916.

Alba (*D. Santiago*), Ministro de Hacienda. Un programa economico y financiero. Enunciacion ante el Senado. (5 de junio, 1916.) Lectura y exposicion ante el Congresso. (30 de septiembre, 1916.) xciii + 241 pp., 8vo. Madrid, 1916.

[These addresses were delivered by the author, who is the Minister of Finance, when introducing a number of economic and financial measures, in the Spanish Senate and in the Cortes.]

Charlier (*C. V. L.*). Studies in Stellar Statistics, iii. The Distances and the Distribution of the Stars of the Spectral Type B. 108 pp. and plates, 4to. Upsala: Edv. Berlings Boktryckeri, 1916.

Dumont (*E.*). Théorie générale des nombres. Définitions fondamentales. 92 pp., 8vo. Paris: Librarie Gauthier-Villars et Cie, 1916. Price 2 francs.

[Contents: 1^{me} Partie. Des nombres absolus: i. Segments de droite; ii. Généralités sur les nombres absolus; iii. Nombres entiers; iv. Complement à la théorie des segments de droite; v. Nombres commensurables; vi. Nombres incommensurables. Seconde Partie. Des nombres relatifs: i. Vecteurs géometriques; ii. Généralités sur les nombres relatifs; iii. Nombres qualifiés; iv. Angles dirigés; v. Nombres complexes (imaginaires); vi. Quaternions; vii. Vecteurs-glisseurs; viii. Biquaternions; ix. Conclusion générale.]

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* See also "Additions to the Library," page 170, *sqq.*

Ebertein (*Gustav W.*). Deutschland im Kriege. 396 pp., 8vo. Zurich: Art. Institut Orell Fussli, 1916.

[A descriptive account of the war from the German point of view, and of its influences on the different classes of the nation. There are numerous illustrations.]

Gurney (*Arthur E.*). The Population of the Polish Commonwealth. With a Preface by Ludwik Janowski, M.A., Ph.D. 39 pp., 8vo. London: George Allen and Unwin, Ltd., 1916. Price 6*d.* net.

Hauser (*Henri*). Germany's Commercial Grip on the World. Her business methods explained. xv + 259 pp., 8vo. London: Eveleigh Nash Co., Ltd., 1917.

[The French edition of this book was noticed at length in the *Journal* for March, 1916, and the present translation should be welcomed by those wishing to read this thoughtful study, and who are unable to do so in the original language.]

Hobson (*J. A.*). The New Protectionism. 153 pp., sm. 8vo. London: Cobden Club and T. Fisher Unwin, 1916. Price 6*d.* net.

[It is not the purpose of the author to go over the whole field of controversy between Protectionists and Free Traders, but to study the fiscal problem under its new aspects since the war, and the conditions that are likely to exist in regard to this question when the war is over. The book is divided into the following chapters:—1. The Revival of Protectionism; 2. Defence and Opulence; The Tangles of a Tariff; 4. Protection no Defence; 5. Navigation Laws; 6. How to meet Trade Aggressions; 7. The Case of Agriculture; 8. Free Trade as a Policy; 9. The Open Door. Appendix A: Recommendations of the Economic Conference of the Allies held at Paris, June 14, 15, 16, 17, 1916. Appendix B: Suggested Tariff adopted by the Council of the London Chamber of Commerce, May 25, 1916.]

Hurry (*Jamieson B.*). Poverty and its Vicious Circles. xiv + 180 pp., 8vo. London: J. and A. Churchill, 1917. Price 5*s.* net.

[The author in a book issued in 1911, entitled "Vicious Circles in Disease," drew attention to the rôle played by the morbid process known as the vicious circle in the aggravation and fatality of disease, and the present work is a study of the influences exerted by the same process on social disorders and especially poverty. Numerous diagrams are introduced showing how problems of poverty can be analysed into their constituent factors with a view to their remedy.]

Lehfeldt (*R. A.*). Economics in the Light of War. 56 pp., 8vo. London: W. Wesley and Son, 1916. Price 1*s.* net.

[A study of the influence of the present war on economic theory. It deals only with production and consumption of wealth and not its distribution, as the author considers there is less that is novel to be said about the latter. It is divided into the following chapters:—1. Spending; 2. Production: the personal factor; 3. Organisation of Production; 4. Production: the material factor; 5. The Aim of Production.]

More (*Adelyne*). Fecundity *versus* Civilisation. A Contribution to the Study of Over-Population, as the Cause of War and the Chief Obstacle to the Emancipation of Women. With special reference to Germany. With an introduction by Arnold Bennett. 52 pp., 8vo. London: George Allen and Unwin, Ltd., 1916. Price 6*d.* net.

[Advocates the restriction of the birth-rate as a remedy for the present excessive infant mortality and other social evils.]

Muller (*Dr. Max*). Frankreich im Kriege, 1914–16. Mit Kunstlerischen Beitragen von Steinlen, Louise Breslau, ed. m. Sandoz und Zahlreichen Abbildungen nach Original-Aufnahmen. 157 pp., 8vo. Zurich: Art. Institut Orell Fussli, 1916. Price 10 francs.

[An illustrated description of the War in France, and of its effects on the different classes of the nation. The book is divided into twelve chapters.]

Norwood (*Dr. Cyril*). The Relations of Capital, Labour and the State. An Address given to Bristol Employers. 39 pp., 8vo. Bristol: J. W. Arrowsmith, Ltd., 1916. Price 6*d*. net.

[The author advocates the extension of trades unions and the formation of trades unions for those industries where they do not at present exist. Equally, in every industry, the employers should be associated, and the author suggests that the various industries should be federated and governed by a council in which are represented the employers, workpeople and the State: the three elements vitally concerned.]

Rey (*Barthelemy*). Quatre cents milliards. Étude sur le coût de la guerre et les indemnités que les puissances ennemies pourront payer. 58 pp., 8vo. Paris: Librairie Berger-Levrault, 1916. Price 1 f. 50 c.

Ricci (*Umberto*). L'Indice di Variabilità e la Curva dei Redditi. 52 pp., 8vo. Roma, 1916.

[Contents: Parte Prima. Primo indice di variabilità tratto dallo scostamento semplice medio. Capitolo i. Definizione dell' indice; ii. Formule per la media aritmetica; iii. Formule per gli scostamenti; iv. Formule per l'indice di variabilità; v. Variazione dell' indice in funione della curva di frequenza. Parte Seconda. Secondo indice di variabilità tratto dalla differenza media. Capitolo vi. La differenza media e il secondo indice; vii. Curva di concentrazione e rapporto di concentrazione; viii. Identità fra il secondo indice di variabilità e il rapporto di concentrazione; ix. Variazione della curva e del rapporto di concentrazione; x. Confronto fra i due indici di variabilità. Parte Terza. La distribuzione de redditi. Capitolo xi. Prima e seconda curva del Pareto; xii. L'uniformità della distribuzione; xiii. Il concetto di "disuguaglianza nella distribuzione dei redditi"; xiv. L'indice nelle seriazioni tronche. Conclusioni.]

Smith (*Harold Hamel*). The High Price of Sugar and how to reduce it. lv + 54 pp., 8vo. London: Bale, Sons and Danielsson, Ltd., 1916. Price 1*s*. net.

[This pamphlet deals with the production of cane sugar within the Empire, and more especially in India and the West Indies. The author is of opinion that an increase in the production of sugar throughout the Empire can be brought about by fostering the growth of the sugar beet in the United Kingdom, and mainly by increasing the area and productivity of the cane-sugar-bearing lands in the Empire generally. One of the difficulties would be the shortage of labour, but the author thinks that by means of improved cultivation and manuring the output could be doubled without increasing the labour.]

Steele (*F. E.*). How our Overseas Trade is Financed. Two Lectures. iii + 22 pp., 8vo. London: Butterworth and Co., 1916. Price 1*s*.

[These two lectures are republished in view of the proposed establishment of a British Trade Bank. As to its prospects these, the author considers, will depend upon the nature and extent of the Government "recognition" which, the committee suggest, it should receive; upon whether and to what degree the joint stock banks are given the opportunity of subscribing to its capital; and upon the *personnel* of its management and directorate. The parts played by banks in financing foreign and colonial trade under present conditions are clearly explained in the lectures.]

Toniolo (*Captain Enrico*). La Mobilitazione Industriale in Italia. 51 pp., 8vo. Milano: A. Saita and Co., 1916.

[Contents: i. La mobilitazione industriale durante la guerra; la vastità del problema; la mobilitazione industriale; i risultati; per l'avvenire. ii. La mobilitazione industriale per dopo la guerra; la gravità del problema; il problema italiano; i pericoli; Un' alleanza interna necessaria; disiplina e organizzazione; il governo e il paese in una grande collaborazione; un giudizio e una ammissione; gli operai—conclusione. Appendice iª. La preparazione tedesca del "dopo guerra"—la contropreparazione delle potenze alleate. Appendice ii. Un giudizio sulla politica economica militare.]

White (*James Dundas*), LL.D., M.P. Land-Value Taxation and Feu-Duties. 23 pp., 8vo. Glasgow: J. Maclehose and Sons, 1916. Price 3*d*.

[In the author's pamphlet *A Scheme for Land-value Taxation*, mention is made of the need for this reform, particularly at the present time, and a description is given of the method by which it should be effected. The principles on which the land-value tax should be apportioned as between the interests in the various properties are also set out, and it is proposed that feu-duties should be dealt with on the same basis as rent charges and rents. This paper is intended to show how that proposal would work out in the case of feued properties, and to give the reasons for it.]

Australian Commonwealth. Analysis of Causes of Invalidity in respect of Claims under the Invalid and Old-Age Pensions Act. 20 pp., 8vo. Melbourne: A. J. Mullett, 1916.

[The Act, which has been in operation for nearly five years, has enabled the authorities to collect valuable information as to the distribution of disease throughout Australia not hitherto obtainable. It deals with some 27,000 cases of males in the Commonwealth aged over 16 years of age.]

Russia. The Russian Year-book, 1916. viii + 779 pp., 8vo. London: Eyre and Spottiswoode, Ltd., 1916. Price 10*s*. 6*d*. net.

[The sixth issue of this useful book has been modified by the omission of certain sections of lesser interest at the present time. In their place will be found a résumé of the state of Russia, economic and industrial, since the beginning of the war, and an account of the directions in which British commercial enterprise may be turned. The other portions of the book have been revised and brought up to date.]

United States. National Foreign Trade Council. European Economic Alliances. A Compilation of Information on International Commercial Policies after the European War, and their Effect upon the Foreign Trade of the United States; also an Analysis of European and United States Commercial Inter-Dependence and Treaty Relations. 128 pp., 8vo. New York City, 1916. Price 25 cents.

[The object of this pamphlet, which is expository rather than argumentative, is to bring to Americans the essential information in regard to changing European commercial policies. It has been compiled as a part of the Council's function to investigate problems arising in foreign trade, and to consider their effect upon the foreign trade of the United States.]

British Association. The Question of Fatigue from the Economic Standpoint. Second Interim Report of the Committee. 24 pp., sm. 8vo. London, 1916.

Income Tax. How to claim Repayment of Income Tax for year 1916–17. 94 pp., sm. 8vo. London: C. Mathieson and Sons, 1916. Price 1*s*. net.

[A useful little book for those wishing to recover a part of the tax which they may have paid in error. The book is not for experts. The whole of the income tax portion of the Finance Act, 1916, is reprinted, and the necessary clauses from the other Finance Acts passed since the war began.]

CURRENT NOTES.

The figures of our foreign trade for the year 1916, given in summary form below, and in greater detail on pages 181 and 182, show that, while the value of imports has registered a large increase owing to the higher range of prices, the exports of British goods have increased in value, as compared with 1915, even more than the recorded imports, so that the excess of the recorded imports over total exports was less in 1916 than in 1915 by 23,000,000*l*. Whether this favourable movement in the merchandise balance has been accentuated or offset by changes in imports not shown in the published returns we have no means of judging.

The values of the principal classes of merchandise imported and exported in the twelve months ending December, 1916 and 1915, respectively, were as follows:—

	Twelve months ending December, 1916.	Twelve months ending December, 1915.	Increase (+) or Decrease (−).
Imports, value c.i.f.—	£'000.	£'000.	£'000.
I. Food, drink and tobacco	419,540,	380,875,	+ 38,665,
II. Raw materials and articles mainly unmanufactured	336,986,	286,569,	+ 50,417,
III. Articles wholly or mainly manufactured	189,273,	181,450,	+ 7,823,
IV. Miscellaneous and unclassified (including parcel post)	3,354,	2,999,	+ 355,
Total merchandise	949,153,	851,893,	+ 97,260,
Imports of bullion and specie	31,468,	21,389,	+ 10,079,
Exports of produce and manufacture of the United Kingdom, value f.o.b.—			
I. Food, drink and tobacco	29,496,	25,082,	+ 4,414,
II. Raw materials and articles mainly unmanufactured	64,343,	52,354,	+ 11,989,
III. Articles wholly or mainly manufactured	393,670,	292,927,	+ 100,743,
IV. Miscellaneous and unclassified (including parcel post)	19,038,	14,506,	+ 4,532,
Exports of foreign and colonial merchandise, value f.o.b.—			
I. Food, drink and tobacco	21,064,	22,399,	− 1,335,
II. Raw materials and articles mainly unmanufactured	49,145,	54,588,	− 5,443,
III. Articles wholly or mainly manufactured	27,295,	22,017,	+ 5,278,
IV. Miscellaneous and unclassified	104,	58,	+ 46,
Total British, foreign and colonial	604,155,	483,931,	+ 120,224,
Exports of bullion and specie	49,190,	46,579,	+ 2,611,

	Twelve months ending December, 1916.	Twelve months ending December, 1915.	Increase (+) or Decrease (−).
Shipping—	Tons net. '000.	Tons net. '000.	Tons net. '000.
Total, British and foreign, *entered* with cargoes................	30,059,	33,724,	− 3,665,
Total, British and foreign, *cleared* with cargoes................	35,597,	39,529,	− 3,932,

The calculations of the *Economist* indicate that the recorded imports, if valued at the average rates applying to imports of goods of similar description in 1915, would have yielded an aggregate of 743,100,000*l.*, or less than in 1915 by about 12½ per cent., and that the exports, valued in like manner at the average rates of 1915, would have yielded an aggregate of 501,400,000*l.*, or about 3½ per cent. more than in 1915. The change in the excess of imports is thus not a mere question of prices, but is a real change of quantities, masked to a considerable extent by price variations. Each of the three principal classes of imports shows a decrease in volume, although an increase in value is recorded for each of them, and exports of manufactured goods have been responsible for the entire increase in volume of exports, since the other two main classes show a decreased volume of movement.

From the figures we have cited from the customary compilation of the *Economist*, it will be seen that the changes in price-level have added about twice as much to the value of the recorded imports, comparing 1916 with 1915, as they have added to the value of the total exports. Comparisons with 1913 yield a result which may be stated in somewhat similar terms, as the valuation of the imports of 1916 on the basis of the average values recorded for 1913 would reduce the recorded total by 293,300,000*l.*, and the total exports of 1916 would, on a similar revaluation, be reduced by 140,700,000*l.*

Nearly all the industries, especially those connected with war requirements, have been fully employed during recent months and in many cases were working overtime. Most of the essential trades would have been able to employ more labour if obtainable. The percentages of unemployed given by the Trade Union returns and the returns for "insured trades" respectively have been as follows :—

At the end of	Percentage of unemployed.	
	Trade unions.	Insured trades.
June	0·5	0·54
July....	0·4	0·55
August	0·4	0·51
September	0·4	0·49
October	0·3	0·49
November	0·3	0·54
December	0·3	0·60

The employers' returns for the textile trades showed 3·7 per cent. fewer hands employed in the week ending December 16, 1916, than in the corresponding week of 1915, while there was a rise of 6·2 per cent. in the wages paid. In all the trades covered by the returns there was a fall of 5·0 per cent. in the numbers employed and a rise of 5·2 per cent. in the wages paid.

In Germany the trade union returns showed 1·7 per cent. unemployed at the end of November as against 2·5 per cent. at the end of May. In the textile trades the percentage had risen further from 13·5 per cent. in May to 15·3 per cent. in October, but in November it fell again to 13·7.

Retail food prices in the United Kingdom have continued to advance since June with the exception of a slight check in August, noteworthy as the first fall to occur since August, 1914. The following are the percentage increases from July, 1914, to the first of each month, as shown by the Board of Trade index-numbers published in the *Labour Gazette* :—

July	61	September	65	November	78
August	60	October	68	December	84

The increase in food prices during the first year of war was approximately 34 per cent., of which 10 per cent. occurred in the first month. During the second year the increase was 19 per cent. Since August 1 last, however, there has been a further rapid advance by 15 per cent. (from 160 to 184). The marked increase in the index-number for November was largely due to the price of potatoes, which stood at more than double the price of a year earlier, but there were also considerable advances in eggs and fish, milk, flour and bread. Between November 1 and December 1 the largest increases recorded were for eggs (largely seasonal) and for cheese, which now stands at a very high level. It must be remembered that all the figures given apply to food only. If rent, clothing, fuel and light, &c., be included it is estimated that the average increase in the cost of living of a working-class family from July, 1914, to the beginning of December is about 60 per cent.

The course of retail prices in Germany and Austria has long since ceased to afford any guide to the state of supplies, as the majority of the index-numbers are based on artificially fixed maximum prices and are not comparable with figures based on the prices in a free market. The last figure for Berlin, given in the *Labour Gazette* for December and based on official data in the *Statistische Korrespondenz*, shows an increase of 109·4 per cent. in retail food prices in October as compared with July, 1914, and a fall of 4·6 per cent. as compared with the preceding month. This fall has been brought about in part by recent reductions in the maximum prices fixed for war bread, rye flour, potatoes and beef, and in part apparently by the mere substitution of a lower quality of coffee as the basis of the October price quotation. For Vienna, a table computed on the basis of figures in the *Arbeiter Zeitung* gives a rise of 176·7 per cent. from July, 1914, to November, 1916, and of 24·9 per cent. from November, 1915, to November, 1916.

The movement of wholesale prices as shown by the *Statist* and *Economist* index-numbers since June last has been as follows :—

Month.	*Statist* index-number.	*Economist* index-number.
July, 1914	82·4	116·6
July, 1916	130·5	191·1
August	134·5	198·7
September	134·4	201·0
October	141·5	208·7
November	150·8	217·2
December	154·3	223·0

Over the two years from the beginning of the war, from July, 1914, to August, 1916, the *Statist* index-number shows a rise of 63·2 per cent., the *Economist* number a rise of 70·4 per cent. It will be seen that after the slight drop in June and July there was a further rapid advance in the autumn. Most groups of commodities shared in the rise, but it was especially notable in the case of vegetable foods and textiles. Between July and December the *Statist* index-number for vegetable foods (corn, &c.) rose from 120·4 to 173·1, or by 44 per cent., and that for textiles from 123·8 to 150·4, or by 22 per cent. Cotton (American middling) touched 12·5*d.* per lb. in November, 1916 : two years before it stood at 4·28*d.*

The *Gazette* price of British wheat, which fell to 50*s*. 2*d*. in June, fell further to 49*s*. 3*d*. in July and then rose continuously to 57*s*. 2*d*. in August, 59*s*. 4*d*. in September, 60*s*. 7*d*. in October, 69*s*. 5*d*. in November and 73*s*. 4*d*. in December.

In the winter of 1913–14 a committee of investigators was appointed by the Secretary of Agriculture of the United States to consider the economics of the meat situation. No formal report was prepared by the committee, but independent inquiries dealing with several phases of the meat situation were undertaken by specialists of the United States Department of Agriculture. The results of these inquiries have been crystallized by the Department in a series of five reports, of which we have received the first three, under the general title "The Meat Situation in the United States." The three reports received deal respectively with "Statistics of "Live Stock, Meat Production and Consumption, Prices and "International Trade for many Countries," by Mr. G. K. Holmes; "Live Stock Production in the Eleven Far Western Range States," by W. C. Barnes and J. T. Jardine, and "Methods and Cost of "Growing Beef Cattle in the Corn Belt States," by J. S. Cotton, M. O. Cooper, W. F. Ward and S. H. Ray. Of these the first is clearly of most general interest in this country.

Mr. Holmes' report deals with animals in relation to population in the principal countries of the world, exports of the nine surplus countries, imports of the fifteen deficiency countries, production of meat and export and slaughter in relation thereto, consumption of meat, and prices, and concludes with notes on selected countries of meat-production and on some conditions and problems in the United States. "The general fact," says Mr. Holmes, "appears "to be that throughout the world cattle are hardly increasing "absolutely, sheep are declining in number, and swine are increasing. "These conditions extend, with here and there an exception, "throughout the world. It would seem as though sheep, not- "withstanding meat and wool, are not economic animals, that "swine are of the contrary character, and that cattle are in the "balance. . . . If the foregoing conclusions are approximately "correct for the absolute numbers of these three classes of meat "animals, the truth is accentuated when comparison is made with "increasing population. Sheep are far from maintaining their "numbers in this comparison, and in some small degree cattle fail "to do so, but in the case of swine there has been some gain above "population in recent years, although it may be a small one" (pp. 67–8). This was written without any allowance for the effects of the war, and it is clear that the number of animals in the belligerent countries and in some of the neighbouring countries has declined. " Various reports indicate that there has been unusual " slaughter for food purposes, and also slaughter because feeds have " been insufficient."

The nine surplus exporting countries considered are Argentina, Australia, Canada, Denmark in the speciality of bacon, Mexico, New Zealand, the United States, Uruguay and Russia—really a deficiency country, but for the present purposes treated as a surplus country on account of its gross exports and its potentiality. " By " 1899 the total meat exports of the nine countries under considera- " tion reached a figure that remained nearly constant until 1911, and " that year was followed by one with a quantity of exports higher than " ever before reached, or 3,861 million pounds. This great quantity, " after deducting about 500 million pounds for mutton, was divided " between beef and pork in the ratio of about 52 per cent. for beef " and 48 per cent. for pork. Pork has lost its old-time lead in " the export trade, but in very recent years shows a tendency to " gain on beef." " The United States certainly to and including " 1912 was still the leading meat-export nation, as it had been " for a great many years, although Argentina had almost overtaken " it in 1912. Under the necessities of the European war the meat " export strength of the United States was largely renewed in " 1915 " (p. 97).

Argentina and Uruguay together exported 36 per cent., the United States 35·1 per cent., and Australia and New Zealand 18·7 per cent. of the world's export of meat and meat-products in 1912, or these three sources together 90 per cent. of the world's total. As regards beef alone, nearly three-fifths of the world's export of beef and beef-products in 1912 belonged to Argentina, about one-fifth to the Australasian colonies, and one-seventh to the United States. By 1914, however, the United States had lost its export trade in fresh, chilled and frozen beef, to be renewed in 1915. For pork about three-quarters of the export belongs (or rather belonged) to the United States, about one-fifth to Denmark, and about one-twentieth to Canada. The proportion must have been greatly affected by the war.

As typical countries that consume more meat and meat-products than they produce, fifteen countries are taken, Denmark as well as the United States appearing in both lists, the former as it is only a surplus country for bacon and hams, and the latter to the extent that it is of interest because it imports, although it is a surplus country for all forms of meat and meat-products together. As regards the composition of the total import trade of these countries, fats and oils declined from 41 per cent. in the ten years, 1895-1904, to 39 per cent. of the total in 1912, while beef, mutton and pork correspondingly increased. Beef and beef-products have gained on the other kinds of meat and meat-products (excluding fats and oils) from 34 per cent. in the ten years named to 42 per cent. in 1912: mutton increased from 10·4 to 12 per cent., and unidentified meat and meat-products from 13 to 15 per cent.: pork and pork-products correspondingly decreased from 42·5 to 31 per cent. On the other hand between 1910 and 1912 mutton and beef and their products declined, while pork and pork-products gained. Up to the date to which the figures are carried the United Kingdom was the leading importing country of meat and meat-products, Germany the second (largely on account of fats and oils) and the Netherlands the third, mainly for the same reason. Since 1913, the United States has become the fourth importer of meat and meat-products among the nations, these imports being mostly chilled and frozen beef from South America and Australasia.

The statistics of meat production are so imperfect and obtainable for relatively so few countries that no summary is attempted, and the United States is the only surplus country for which Mr. Holmes finds himself able to give exports as a percentage of production. In 1900, 15 per cent. of the meat production of the United States was exported: in 1909, 8·8 per cent. For beef alone the figures were 10·9 per cent. and 6 per cent. respectively. As regards consumption, Australia and New Zealand stand at the head of the list with per capita consumptions estimated in 1902 at 262·6 and 212·5 lbs. respectively. The United States come next with the high, though declining consumption of 170·6 lbs. in 1909. The consumption of the United Kingdom has been estimated by various authorities in recent years at 119 to 121 lbs., and that of Germany at 112 to 116 lbs. Prices of cattle, sheep and swine and of beef, mutton and pork have been collected by Mr. Holmes from all available countries, and the charts all tell the same tale with but slight exceptions and variations—a great and rapid rise from 1896 onwards. "The general fact is that meat production has not "kept up with the increase of population in some degree, and with "customary demand by meat consumers. The inevitable measure "of this changed relationship between supply and demand is price. "and the price compilations that have been made restate what "has already appeared under a consideration of the number of "meat animals throughout the world, namely, that the United

" States is not alone in its relative decline, but that it is participating " in a world-wide movement. Increasing cost of meat production, " also, may be regarded as a factor " (p. 165).

The report, with its summaries of data from many countries, should be very useful at the present juncture, though when the present tense is used it must usually be remembered that the reference is in fact to pre-war periods—in fact, occasionally to years no later than 1912. The volume would have been rather more convenient for study if it had been divided into separate chapters relating to the several subjects, animals in relation to population, exports, imports, production, consumption and so forth.

A Munitions Committee for Rhodesia was formed in November, 1915, on the invitation of the Government Munitions and Industries Committee of the South African Union, as one of the branches of that body. The main branches of the work of the Committee had reference to inventions, assistance to the military authorities, and the industries and resources of the country. The volume of the work, particularly in regard to the investigation of the industries and resources of the country, continuously increased and from July 1, 1916, the title of the Committee was altered to the " Rhodesia Munitions and Resources Committee." An interim report has now been issued, which gives many interesting details as to the possibilities of development. The absence of any classified arrangement in the report renders abstraction somewhat difficult, but we may note the following points of interest.

The cattle industry has made remarkable progress during the past few years and may become at no distant date the most important in Rhodesia. An almost unlimited market appears to be available for prime stock at the Johannesburg stockyards ; while the extra railage from the eastern part of the country may preclude it from sharing in the new outlet, consideration is being given to the establishment of meat canning. A creamery established at one centre in 1913 can more than cope with the existing demand for butter, but cheese making and condensed milk manufacture would afford outlets for export. There is a large export of hides and skins from Rhodesia, and as raw material for tanning purposes can be procured locally at reasonable prices a tanning industry might be created. A small bacon factory was started at Salisbury in 1914, but there is scope for considerable expansion.

Cotton growing has not proved very successful, the hours of sunshine during the growing period obtained throughout the possible cotton belt not exceeding 920 as against 1,040 to 1,500 in the American cotton belt, and it is desirable to await the report on the experiments of the British South Africa Company before attempting any further extension. Tobacco growing has suffered from the farmers sacrificing quality to quantity, and there has consequently been difficulty in disposing of the surplus beyond the limited local demand. On the other hand, there seem to be considerable possibilities of extension in the cultivation of fibre plants and in the growing of fruit, especially oranges. There should be a possibility of the local manufacture of twine and rope from the home grown fibres, and fruit growing should bring the bottling and drying industry in its train. The native timbers are also admirably suited for the making of doors, window-frames, &c., and the manufacture of furniture. Others are suitable for the manufacture of pick and hammer handles, for pit props and similar purposes and for the manufacture of wood-meal for dynamite. The cultivation of ground nuts should be extended. A small plant for expressing oil was erected in Salisbury in 1915, and has recently commenced soap manufacture. The soap finds a ready sale, as does also the oil cake made from the residue, but glycerine, which is in urgent demand for the manufacture of explosives, is not at present made. It is recommended that the Government should create a branch of the Botanical Division of the Agricultural Department for the purpose of carrying out the investigation of the economic products of indigenous plants.

Turning to minerals, the chrome-iron quarried at Selukwe has for some time been one of the chief sources of the world's supply, and the demand is certain to increase. Platinum is associated with chromite in other parts of the world and should be sought for. Grindstones and whetstones might well be produced locally. Vast quantities of lime are available and should be worked for agricultural and other purposes. Several deposits of graphite are known to occur, and although samples have not been favourably reported on for export it could possibly replace the imported graphite compositions used for packing and lubrication. The white arsenic obtained in the treatment of arsenical gold ores is frequently allowed to go to waste : it should be recovered, as much is imported in the form of cattle and sheep dips. The more promising deposits of mica should be re-examined ; molybdenite has been recorded from a number of localities ; talc is quite a common mineral, occurring in large bodies in a more or less pure form ; the presence of two tantalum minerals has been noted and prospectors should devote further attention to this discovery ; and the ores of tungsten and vanadium that occur might repay further investigation. Nothing is at present done at the Wankie colliery in the recovery of byeproducts, but the colliery manufactures first-class firebricks and there appears to be room for expansion in this trade in the manufacture of assay crucibles, liners, &c.

In the conclusion of their report the Committee emphasize the disadvantages under which the industries of the Territory suffer owing to the high rates on the Rhodesian railways. "The "Committee consider that they would be failing in their duty if "they did not draw attention to the possibilities which exist in "Rhodesia for the development of many industries if reasonable "traffic rates were offered. It is believed that the time has arrived "for a full enquiry to be instituted by the Railway Companies in "order to ascertain how far they can go to meet the hopes that have "been expressed that an export trade should be built up and the "country made more self-supporting."

Professor Chambrelent of the University of Bordeaux contributes to the *Revue Scientifique* for July 1-8 a study of the statistics of still-births in France. It must be remembered in this connection that all cases are registered as still-births (morts-nés) in France in which the child is presented dead at the time of registration, that is within three days of the birth. The statistics do not permit of any distinction between still-births properly so-called and infants dead within three days of birth. Such as the data are, they give a ratio of approximately 47 still-births per thousand born alive for the four years, 1907–10. The ratio is greater for the towns than for the rural districts. For the year 1910, the coefficients run: 39 per thousand live births for the rural population, 55 for the "agglomérations urbaines," 62 for Paris and the Department of the Seine. Statistics published by the Ministry of the Interior for the decennial period 1896–1905 give coefficients of 53 for towns of 5,000 to 30,000 inhabitants: 61 for towns of 30 to 100,000 inhabitants: 69 for towns of over 100,000 inhabitants, and 93 for Paris. It has been suggested that the differences observed between the rural districts and the larger towns, especially Paris, is to be attributed mainly to the better registration of still-births in the latter. Dr. Chambrelent does not believe in this explanation, and considers that the real cause lies in the better hygienic conditions of the small towns, and especially of the rural districts, the lower rates of alcoholism, the lesser prevalence of venereal diseases and so forth. The rate per thousand births varies greatly from one Department to another, and is lowest in the centre and south-west of France, greatest in the north and the south-east. This distribution it is stated, though the numerical evidence is not produced, follows that of the consumption of alcohol, more particularly the consumption of the "surtaxed alcohols," absinthe, vermouth and bitters.

The proportion of still-births, as is well known, is considerably greater for the male sex than for the female, the proportion of males to females amongst the still-born of the years 1907–10 being 134 to 100. Some light is thrown on the causes of this difference by data obtained from a lying-in hospital, and covering 3,528 births. For the cases in which death had taken place during the period of gestation these data give a ratio of 101 males to 100 females: for the cases in which death took place during birth, 133 males to 100 females: for the cases in which death took place after birth, 141 males to 100 females. The difference arises therefore during and after birth, and is attributable mainly to the greater size of the male infant and the resulting difficulty of parturition. Objection was raised to this explanation by Dr. Jacques Bertillon, on the ground that the rate was higher for males than for females whatever the length of the gestation and that the higher rates could not therefore be attributed to the size of the fœtus. Analysing the same data afresh so as to exclude all cases in which the infant had in fact been born alive and breathed before death, Dr. Chambrelent finds for births during the sixth, seventh and eighth months the relatively low male to female ratios of 105, 105 and 102, the ratio only rising to 131 for births during the ninth month. It is true that for births during the earlier months of gestation very high ratios are found, but it is thought that these may legitimately be attributed to errors in the determination of the sex.

The Departmental Committee appointed by the Treasury on January 27, 1916, to consider and report upon any amendments in the financial scheme of the National Insurance Acts which experience may suggest, and to advise how far the work of approved societies could be simplified and its cost reduced, has presented a further report. [Cd. 8396.] The first part of the reference to the Committee was dealt with in its interim report, noted in the issue of this Journal for May last. The present report deals with the second part, but it leaves for a future and final report "a few sections of the Acts "involving social questions of a somewhat wider character."

Matters which involve legislation and matters which may be dealt with by regulations under existing powers conferred by the Insurance Acts are separately considered in the report. Inverting that order, we begin with the matters that can be disposed of by the simpler method. These concern, first, the arrangements for the final settlement by the Commissioners on appeal of disputes arising under the Act. On this the Committee recommend that regulations should be made dealing with cases where fresh evidence is tendered, and simplifying the procedure.

On the second point, the security to be given by approved societies, they give some interesting statistics. That security has been provided in two ways, by the creation of a joint committee fund, and by national funds for England, Scotland, Ireland and Wales respectively. Societies having 10,340,000 members have availed themselves of these funds and contribute to them 23,785*l.* a year, for insurances of an aggregate amount at risk of 5,232,750*l.*, the premium averaging 9*s.* 1*d.* per cent. of that risk. The total losses on this large sum in the three years 1913–5 have been only 4,426*l.* or 1,475*l.* a year, equal to 7*d.* per cent. of the risks insured ; and the expenses in the year 1915 were 2,697*l.*, or one shilling per cent. The funds accumulated are already 70,300*l.*, producing in interest 4,430*l.* a year, which is more than enough to pay the annual losses and expenses. If this experience could be relied upon as a safe guide to the future, the contributions of the societies might be suspended, and future entrants accepted at a single premium of about 30*s.* for every 100*l.* at risk, but the Committee have not seen their way to this conclusion, and content themselves with recommending a reduction of contribution to one farthing per member per annum, which is equivalent to 4*s.* 1*d.* for every 100*l.* at risk, until a limit of 6*d.* per member (which appears unnecessarily high) has been reached. At any rate, these statistics place in bright light the probity of friendly society officials generally. We think the Committee have to some extent misdirected themselves by considering the matter from the point of view of membership and not of risk.

In the third place, the Committee criticize severely the book-keeping of societies, and submit for consideration the question whether the Commissioners ought not by regulation to take wider powers of control. On the other side of the question they indicate some simplifications in accounting which, in their opinion, are of a substantial character.

The recommendations involving legislation made by the Committee are as follows :—

1. As to voluntary contributors. Of these, there are only 28,000, who are more trouble than they are worth, and it is recommended that no new entrants should be admitted on a voluntary basis.

2. As to late entrants, minors, and persons ceasing to be insured under section 9 of the Act of 1911, it is recommended that the

provisions to the disadvantage of these classes should be repealed, and the Committee justly criticize some of them as not easy, either for the insured person to understand, or for the society to administer.

3. As to arrears, the abolition of reserve contributions is recommended, and a new scheme for employed contributors is outlined.

4. With regard to low-wage earners, for whom a State penny was provided by the Act, an estimate is furnished of 65,200*l.* as the cost of that penny in a complete financial year, based upon the experience of the first half of 1914, and this is shown to be a very inadequate provision. The remedy for this is left to the wisdom of Parliament.

5. With regard to married women, a scheme is proposed in substitution for s. 44 of the Act.

6. With regard to aliens, the repeal of section 45 is recommended.

7. With regard to persons in the naval and military service of the Crown a scheme is suggested for arrangement with the Admiralty and Army Council.

8. For cases where the employer is liable to pay wages during sickness (a class of employees numbering 134,000) the repeal of sections 47 and 53 is recommended.

9. For the mercantile marine some simplifications and modifications are devised.

10. As to notice of sickness, an amendment is recommended.

11. Where contributors are entitled to the compensation or damages, the difficulties which have been raised are discussed at length, and the only recommendation made for legislation is that an oversight in the drafting of Section 11 should be remedied.

12. As to the case of contributors who are inmates of hospitals, an amendment of Section 12 is proposed in their interest.

13. On the question of transfers between approved societies, some remedies are proposed, but these are dissented from by Miss McArthur, who represented the Women's Trade Union League, and states her views in an appended memorandum.

14. With regard to the administration account and mode of audit, which create trouble where the same societies carry on both State and private business, the recommendations of the Committee tend to greater stringency in legislation and administrative regulation, a conclusion which is perhaps inevitable, but is still one to be regretted.

15. Special provision is recommended as to persons becoming certificated teachers.

16. It is stated that 362,128 cards, representing 66,462*l.*, remain

unidentified in the hands of the Commissioners, and it is suggested that this sum might be transferred to the Sinking Fund, subject to any claims that may be made upon it.

17. With regard to the transfer of engagements of societies and branches, an extension of the powers to make regulations is recommended—a facile but, as it appears to us, a dangerous remedy.

18. Finally, new machinery is devised to solve questions relating to the administrative account and administrative methods of approved societies.

The vacancy in the Committee caused by the resignation of Mr. Rockliff has been filled by the appointment of Mr. Tuckfield, Secretary of the National Deposit Friendly Society, who has joined other members representing approved Societies in an addendum to the report urging that vacancies in the English Commission should be filled by persons who have had practical experience.

The report gives convincing evidence of the care and patience with which the members of the Committee have devoted themselves to the investigation and solution of the many difficult and intricate problems that have arisen in the working of the Acts. When the composite nature of the Committee, representing many different interests, is considered, it is satisfactory to note that the report is signed by the whole of the members. As many as 60 witnesses were examined, and an equal number of societies submitted suggestions in writing.

THE following analysis of books published during 1916 is reprinted from *The Publishers' Circular* of January 6, 1917 :—

A total of 9,149 books and pamphlets is recorded by *The Publishers' Circular* as being published during the year 1916. This represents a decrease of 1,516 items compared with the figures for 1915, and is naturally accounted for by the increasing difficulties and cost of production. The average quality of output has not returned to that of pre-war days, but the general level has not sunk as might have been expected under existing conditions. It may be noted that increases have occurred in the classes—philosophy, domestic arts, business, music, fiction, geography, general works and military and naval.

It should be noted that in the following classes, " Education " includes only books about educational theory and practice, and not text books on special subjects, which are classed elsewhere ; and also that under " Music " only works about music are recorded. It would be possible to swell the total to a much greater figure by counting numerous leaflets (Government and other), ephemeral pamphlets, the publications of borough councils and other local government bodies, and musical texts. While it is obvious that our total could be increased greatly by the inclusion of all this literary protozoa, the figures would not represent so accurately the book publishing activity of the United Kingdom.

The following totals of the last ten years are of considerable interest :—

Year.	New books.	New editions.	Total.
1907	7,701	2,213	9,914
'08	7,512	2,309	9,821
'09	8,446	2,279	10,725
'10	8,468	2,336	10,804
'11	8,530	2,384	10,914
'12	9,197	2,870	12,067
'13	9,541	2,838	12,379
'14	8,863	2,674	11,537
'15	8,499	2,166	10,665
'16	7,537	1,612	9,149

Classified analysis of books published during the year 1916.

Classes of Literature.	New books.			New editions.	Totals for 1916.	Totals for 1915.
	New books.	Translations.	Pamphlets.			
Philosophy	200	7	27	15	249	237
Religion	588	5	106	86	785	896
Sociology	343	3	193	36	575	694
Law	117	—	23	32	172	258
Education	110	—	98	3	211	293
Philology	123	—	6	19	148	216
Science	291	3	42	38	374	698
Technology	181	2	24	68	275	520
Medicine, Public Health, &c.	191	2	41	59	293	356
Agriculture, Gardening	146	—	32	14	192	224
Domestic Arts	62	—	11	11	84	57
Business	147	—	39	13	199	186
Fine Arts	161	—	28	11	200	225
Music (works about)	48	—	5	1	54	45
Games, Sports, &c.	48	—	4	3	55	75
Literature	231	8	38	42	319	378
Poetry and Drama	415	13	37	86	551	567
Fiction	952	30	4	844	1,830	1,693
Juvenile	426	2	36	95	559	582
History	450	6	53	30	539	763
Description and Travel....	205	1	32	43	281	483
Geography	82	—	126	7	215	182
Biography	238	1	16	30	285	394
General works	191	—	18	—	209	176
Military and Naval	279	—	190	26	495	467
Totals	6,225	83	1,229			
	7,537			1,612	9,149	10,665
Totals for 1915	8,499			2,166	10,665	

Analytical table showing books published each month during 1916.

	Jan.	Feb.	March.	April.	May.	June.	July.
New	398	461	416	514	604	643	497
Translations	14	6	3	12	5	6	10
Pamphlets	115	108	84	60	122	109	109
Total new books	527	575	503	586	731	758	616
New editions	79	92	112	142	171	142	151
Totals	606	667	615	728	902	900	767
Total for 1915	725	868	750	994	911	862	739

	August.	Sept.	Oct.	Nov.	Dec.	Totals 1916.	Totals 1915.
New	364	510	702	556	560	6,225	7,560
Translations	4	3	9	7	4	83	173
Pamphlets	103	103	119	101	96	1,229	766
Total new books	471	616	830	664	660	7,537	8,499
New editions	113	167	180	157	106	1,612	2,166
Totals	584	783	1,010	821	766	9,149	10,665
Total for 1915	655	1,008	1,147	1,023	983	10,665	

In the preceding tables each book is counted as one, whether it is in one or more volumes. Serials that appear later as a collected volume are counted as an ordinary book on the appearance of that volume ; so that, for example, the series of " Statutory Rules and Orders " issued by the Government, and amounting to several hundred in the year, are counted as one item on the appearance of the annual collected volume. The same rule applies to volumes of magazines, &c. Further detailed information regarding the year's publishing is supplied by the appended analytical tables.

STATISTICAL AND ECONOMIC ARTICLES IN RECENT PERIODICALS.

UNITED KINGDOM—

Accountants' Magazine—

December, 1916—Trade after the War.

January, 1917—Excess Profits Duty in relation to Rubber Plantation Companies.

Associated Accountants' Journal—

September, 1916—The Metric System and Decimal Money: *Cox* (*Harold*). Income Tax, 1916–17.

November, 1916—State Services: Banking: *Radford* (*George*). Notes of Railway Stock, &c.: *Cummings* (*W.*).

Bankers' Magazine—

August, 1916—The Great Crisis: XXV. The Military and Economic Conflict. The Standardization and Equation of Money-Values. The Economic Conference. The Report of the Bank of France for 1915.

September, 1916—The Great Crisis: XXVI. Concerning Silver: *Spalding* (*W. F.*). War Loans and the Pass-book System: *Gibson* (*A. H.*). The Imperial Bank of Germany.

October, 1916—The Great Crisis: XXVII. Favourable Developments. The Great Commercial Banks of Germany: *Palgrave* (*Sir R. H. Inglis*). Trade after the War. The Banking Half-Year in Canada. How to Calculate the Yield on Securities allowing for Redemption. Preparedness for International Commerce.

November, 1916—The Proposals for a British Trade Bank. The Great Crisis: XXVIII. Bank of the Netherlands, 1915–16.

December, 1916—The Trade Bank Proposals. The Great Crisis: XXIX. Trade Banks: *Palgrave* (*Sir R. H. Inglis*). Institute of Bankers: Presidential Address. Bank of the Netherlands, 1915–16.

Economic Journal—

September, 1916—The War and Japanese Finance: *Soyeda* (*J.*). British Industry after the War: *Lehfeldt* (*Prof. R. A.*). The Scandinavian Gold Policy: *Wicksell* (*Prof. K.*). The Present Situation of the Foreign Exchange: II. *Cassel* (*Prof. G.*). Ex-Service Men on the Land: *Scott* (*Leslie*). British Incomes and Property: *Edgeworth* (*Prof. F. Y.*). Some Family Budgets from Bihar: *Horne* (*Prof. E. A.*). The Triple Alliance of Labour: *Carter* (*G. R.*). The Relation between Unemployment and Sickness: *Ashton* (*T. S.*).

December, 1916—Interest after the War and the Export of Capital: *Pigou* (*Prof. A. C.*). Inflation of the Currency and the Rise in Prices: *Nicholson* (*Prof. J. S.*). The Commercial Policy of France after the War: *Gide* (*Prof. Ch.*). The Task of the Welfare Supervisor: *Ashley* (*Prof. W. J.*). The Spitalfields Acts, 1773–1824: *Clapham* (*J. H.*). The Report on Food Prices: *Cannan* (*Prof. E.*). German and British

UNITED KINGDOM—*Contd.*

Economic Journal—Contd.

December, 1916—*Contd.*

Agriculture: *Fay* (*C. R.*). A British Trade Bank: *Addis* (*Sir Charles*). The Economics of the War and its Sequel: *Price* (*L. L.*). The Mystery of the Medieval Draper: *Scott* (*Prof. W. R.*). Russian Financial Policy (1862–1914): *Raffalovich* (*A.*). The Demand for Labour as shown by Rates of Wages offered by Employers: *Leppington* (*C. H. d'E.*).

Eugenics Review. October, 1916—The Theory of Sex: *Wilde* (*Archer*). The Eugenics Education Society and Venereal Disease: *Darwin* (*Major Leonard*). The Study of Heredity. Part 3: *MacBride* (*Prof.*).

Financial Review of Reviews—

September, 1916—The Economics of War: *Belloc* (*Hilaire*). The Thrift Movement and the Future of Investment: *Quail* (*Jesse*). Our Impregnable Financial Position: *Stiles* (*C. R.*). The Investment Aspect of Rubber Shares: *The Editor.* International Financial Information.

December, 1916—The Financial Future of Aircraft Construction: *Grey* (*C. G.*). The Unused Capital of the Empire: *Wright* (*Arnold*). Si Vis Pacem Para Bellum: *Gardner* (*J.*). Corporate Wealth, its Origin and Growth: *Stiles* (*C. R.*). The Housing Question and the Finance Act, 1909-10: *The Editor.*

Bulletin of the Imperial Institute—

April–June, 1916—The Work of the Imperial Institute for India: *Dunstan* (*Wyndham R.*). Recent Progress in Agriculture and the Development of Natural Resources.

July–September, 1916—Recent Work on Monazite and other Thorim Minerals in Ceylon. The New Coal-Field in West Africa. Occurrence and Utilisation of Antimony Ores. Occurrence and Utilisation of Cobalt Ores. The Cultivation of the Pine-Apple for Fruit and Fibre.

Journal of the Institute of Bankers—

November, 1916—The Probable Effect of the War upon the Trade of the World: *Bull* (*A. J.*). Currency Curiosities from France: *Minty* (*Lance-Corporal L. M.*).

December, 1916—Inaugural Address of the President: *Pownall* (*George H.*).

Royal Meteorological Society Journal. October, 1916—On the Re-adjustment of Pressure Differences. Two Species of Atmospheric Circulation and their Connection: *Bonacina* (*L. C. W.*). Note on Mr. Bonacina's Paper "On the Re-adjustment of Pressure Differences": *Shaw* (*Sir Napier*). Report on the Phenological Observations in the British Islands, from December, 1914, to November, 1915: *Clark* (*J. E.*) and *Adames* (*H. B.*). The Relation between Atmospheric Pressure and Rainfall at Kew and Valencia Observatories: *Chapman* (*Lieut. E. H.*). Dr. Robert Henry Scott, F.R.S.: *Curtis* (*R. H.*) and *Marriott* (*W.*).

UNITED KINGDOM—*Contd.*

Journal of the Board of Agriculture—

August, 1916—The Improvement of Live Stock in England and Wales. The Recent Development of German Agriculture. The East Anglian Milk Recording Society: *Chevallier* (*J. B.*) and *Oldershaw* (*A. W.*). Enterprise in Dairy Farming: *Bond* (*J. R.*).

September, 1916—The Value of Immature Potato Tubers as Seed: *Hutchinson* (*Henry P.*). Possibilities of Increased Crop Production. The Dairying Industry of England and Wales.

October, 1916—The Utilisation of Waste Land: *Dutton* (*F. V.*). Suburban Poultry-keeping. A War-time effort: *Hutchinson* (*Lucy A.*).

November, 1916—Agriculture and the War: Report of a Meeting between the President of the Board of Agriculture and Fisheries and Members of the Somerset War Agricultural Committee and Others at Taunton. The Economic Importance of Aberdeen Angus Cattle: *Stewart* (*W. A.*). The Farmer and Self-Improvement. The Encouragement of Cheese Production.

December, 1916—French Agriculture and the War. Report on Seeds purchased in Central and South Wales, Seasons 1915–16: *Stapleton* (*R. G.*). Egg Production: *Tarbet* (*W. G.*).

Public Health—

August, 1916—Phthisis in the Potteries: *Magill* (*James*).

September, 1916—Acute Epidemic Cerebro-Spinal Meningitis: *Thomson* (*Charles S.*). Meat Inspection: *Howarth* (*William J.*).

October, 1916—Standards for Determining the Purity of Milk: *Robertson* (*John*). The Hygiene of Prisoners of War: *McWalter* (*J. E.*). The Final Report of the Royal Commission on Venereal Diseases: *Gibson* (*Thomas*).

November, 1916—The Future of Preventive Medicine: *Robertson* (*John*). The Co-ordination of Preventive and Clinical Medicine: *McMaster* (*A. B.*).

December, 1916—War and National Welfare: *Bailey* (*T. Ridley*). After the War: *Kerr* (*Harold*).

Journal of the Institute of Actuaries. October, 1916—Central-Difference Interpolation Formulæ: *Sheppard* (*W. F.*). National Insurance Acts: The Departmental Committee's Interim Report. Legal Notes: *Sharman* (*William Charles*). On the determination, by means of Bond-value Tables, of the rate yielded by a redeemable bond when Income Tax is taken into account. Ordinary and Osculatory Interpolation. A General Method of obtaining Interpolation Formulæ. Notes on the Mortality Experience of Missionaries of the Wesleyan Methodist Missionary Society.

Journal of the Royal United Service Institution. November, 1916—The Training of the New Army, 1803–1805: *Fuller* (*Major J. F. C.*). The Necessity for an adequate Army in the Future.

UNITED KINGDOM—*Contd.*

Manchester. Transactions of the Manchester Statistical Society. Session 1915–16—Cotton Trade during the Revolutionary and Napoleonic Wars: *Daniels* (*G. W.*). The Position of the Doctrine of *Laissez-faire* after the War: *Ellinger* (*Barnard*). Treasury War Bonds: *Fraser* (*D. Drummond*). The Value of Money: *Jack* (*A. Fingland*).

Ireland. Journal of Department of Agriculture—

July, 1916—Provisions of Fisheries (Ireland) Acts relating to Mills and Factories. Irish Minerals and Raw Materials. Opportunities for Development: *Lyburn* (*E. St. J.*).

October, 1916—Flax-growing Experiments, 1914 and 1915. Present and Future Timber Supplies of Ireland: *Forbes* (*A. C.*). Market Gardening as a Career for Women: *Humphreys* (*L. J.*). Present Position and Future Prospects of Swine-breeding in Denmark: *Mörkeberg* (*Peter A.*). The Dublin Cattle Market: *Roulston* (*O. W. H.*). Fourth Irish Egg-laying Competition, 1915–16. Egg Records, 1915–16.

INDIA—

The Wealth of India—

September, 1916—The Infant Industry Argument: *Mukherjee* (*Prof. B.*). Land Banks in the United States: *Singh* (*St. Nihal*). Commercial America: *Pratt* (*Hon. Edward E.*). Income and Wealth of India: *Lal* (*Manohar*).

October, 1916—Marine Industries in Japan: *Singh* (*St. Nihal*). Co-operative Grain Banks: *Rao* (*N. Ananta*). The Poverty of India.

November, 1916—The Population Problem in India: *Shah* (*P. G.*). Government Aid to Industries. The Village Industries of India: *Ewbank* (*R. B.*). Russia and the Paris Conference: *Heyking* (*Baron de*).

Bengal Economic Journal. Vol. 1, *No.* 2. *September*, 1916—Agricultural Distress in Brahmanbaria: *Pringle* (*J. M.*). The Indian Co-operative System and its Critics: *Coyajee* (*J. C.*). Fluctuations in the Prices of Securities: *Williams* (*T. T.*). The Economic Survey of My Native Village: *Pathak* (*P. C.*). Mechanism of Exchange in the Persian Tea Trade: *Coyajee* (*J. C.*). Some Features of the Bankura Famine: *Hamilton* (*C. J.*). The Indian "Wheat Scheme": *Hamilton* (*C. J.*).

UNITED STATES—

American Economic Review—

September, 1916—Factors in American Mortality: *Dublin* (*Louis I.*). Collective Bargaining in the Glass Bottle Industry: *Wolman* (*Leo*). Bases of Valuation in the Control of Return on Public Utility Investments: *Bauer* (*John*). Marketing Farm Produce by Parcel Post and Express: *Hibbard* (*H.*) and *Hobson* (*Asher*). A Description of Bills of Exchange, 1559: *Marx* (*Alexander*).

UNITED STATES—*Contd.*

American Economic Review—Contd.

December, 1916—Construction of a Business Barometer: *Persons* (*Warren M.*). The Federal Rural Credit Bill: *Putnam* (*George E.*). Tax Exemption through Tax Capitalization: a Reply: *Seligman* (*Edwin R. A.*). The Farmer's Labour Income: *Vogt* (*Paul L.*). Regulation of a Government-fostered Merchant Marine by Automatic Tempering of Securities: *Blue* (*F. K.*). The New Revenue Act: *Blakey* (*Roy G.*). State and Local Taxation of Banks: *Fairchild* (*Fred Rogers*). Control of Return on Public Utility Investments: *Lincoln* (*Edmond E.*).

American Journal of Sociology—

July, 1916—The Organization of Effort: *Ross* (*Edward A.*). Social Devices for Impelling Women to Bear and Rear Children: *Hollingworth* (*Leta S.*). Trade Unions and Efficiency: *Tead* (*Ordway*). Youthful Offenders; a Comparative Study of Two Groups each of 1,000 Young Recidivists: *Healy* (*William*) and *Bronner* (*Augusta F.*). Exemptions as a Principle of Social Justice: *Underwood* (*J. H.*).

September, 1916—Sentimentality and Social Reform: *Todd* (*A. J.*). Factors which have to do with the Decline of the Country Church: *Boisen* (*Anton T.*). Implications of a Standard of Living: *Hexter* (*Maurice B.*). Durable Monogamous Wedlock: *Cutler* (*J. E.*).

Annals of American Academy of Political and Social Science—

July, 1916—Contains a series of articles by different Authors on Preparedness and America's International Programme, grouped under the following heads:—Part 1. The Basis of a Durable Peace and the Safeguards against future International Conflicts. Part 2. What programme shall the United States stand for in International Relations? Part 3. The Effect of a Large Military and Naval Establishment on our Domestic Institutions and Policy.

September, 1916—Contains a series of articles by different Authors on New Possibilities in Education, grouped under the following heads:—Part 1. Points of Emphasis in the Curriculum and Organization of the Modern School. Part 2. Continuing Readjustment of the Curriculum and Organization of the Modern School. Part 3. The Extension of Opportunities for Adult Education.

November, 1916—Contains a series of articles by different Authors on America's changing Investment Market, grouped under the following heads:—Part 1. International Investments before the European War. Part 2. Influence of the European War. Part 3. Capital Needs of the Near Future. Part 4. The United States in the Investment Market.

Bankers' Magazine (*New York*)—

September, 1916—A Defect of the Federal Reserve Collection Plan: *Requard* (*George G.*). Observations of a Country Banker: *Larned* (*W. Livingston*).

UNITED STATES—*Contd.*

Bankers' Magazine (New York)—Contd.

October, 1916—The Averted Railway Strike. The Recent Loan to Great Britain. Is the Government Debt Statement Misleading? Meeting After-War Competition.

November, 1916—A New Departure in British Banking. The Banker and the Distribution of Wealth: *Bonesteel (Verne C.)*. Co-operation: *Chapman (Joseph)*.

Journal of Political Economy—

July, 1916—A Critique of Index Numbers of the Prices of Stocks: *Mitchell (Wesley C.)*. Some Impending National Problems: *Fisher (Irving)*. Trade and Industry in Ireland in the Sixteenth Century: *Lough (Susan M.)*.

October, 1916—The Movement for Tax Reform in Virginia: *Page (Thomas Walker)*. Purveyance in England under Elizabeth: *Sears (Louis Martin)*. The Concentration of Water Powers: *Nehf (Harley W.)*. The Elevator Movement in the Pacific North-West: *Lewis (Howard T.)*.

November, 1916—Scientific Management and Labor Welfare: *Hoxie (Robert F.)*. The Development of Hoxie's Economics: *Hamilton (Walton H.)*. Robert F. Hoxie: Investigator and Interpreter: *Frey (John P.)*. A Tentative Bibliography of Robert F. Hoxie's Published Works.

Political Science Quarterly. September, 1916—The Cream of Wheat Case: *Slichter (Sumner H.)*. Allowance for Working Capital: *Bauer (John)*. Reconstruction of the British Empire: *Schuyler (R. L.)*. Record of Political Events: *Sait (E. M.)* and *Moon (P. T.)*.

Quarterly Journal of Economics. November, 1916—The Taxation of Property and Income in Massachusetts: *Bullock (Charles J.)*. Why Organized Labor Opposes Scientific Management: *Hoxie (R. F.)*. Teaching the Introductory Course in Economics: *Persons (Charles E.)*. The Fall in German Exchange: *Bonn (M. J.)*. Commercial Contracts of the Genoese in the Syrian Trade of the Twelfth Century: *Byrne (Eugene H.)*.

Quarterly Publications of American Statistical Association. September, 1916—Scope and Method of Statistics: *Westergaard (Harald)*. Comments on Westergaard's "Scope and Method of Statistics" by various Writers. The Federal Farm Loan Act: *Palmer (Walter B.)*. Wages in American Cities: *Ogburn (W. F.)* and *Kelly (Esther)*. Highway Accidents in New York City during 1915: *Case (Mills E.)*. Regularity of Employment: Need of Standardization of Methods for Measuring Regularity of Employment: *Stone (N. I.)*.

Yale Review. October, 1916—American Neutrality after the War: *Angell (Norman)*. The Sorrows of Ireland: *Aberdeen (Lady)*. Belgium in England: *Davignon (Henri)*.

CUBA—

La Reforma Sociale. September, 1916—Desarrollo de estadística demográfica en la Isla de Cuba: *Roy (Dr. Jorge Le)*. El curso de los Acontecimientos en Cuba durante el gobierno de Gabriel de Luxán 1579–89: *Wright (J. A.)*.

FRANCE—

Bulletin de la Statistique Générale de la France—

July, 1916—Enquête sur les prix de vente au détail des denrées dans les villes (2^e trimestre 1916). Cours des denrées à Paris (gros et detail).

October, 1916—Le mouvement des prix de gros depuis 1914 avec rappel du mouvement général des prix depuis 125 ans: *March* (*Lucien*). Enquête sur les conditions de la vie ouvrière et rurale en France en 1913–14 : *Dugé de Bernonville* (*L.*).

Bulletin de Statistique et de Législation Comparée—

June, 1916—Le produit des contributions indirectes pendant l'année 1915. Le commerce de la France avec les pays étrangers. Allemagne : Les caisses de prêts de l'Empire en 1915. Russie : Le commerce extérieur.

July, 1916—L'impôt sur les vélocipèdes en 1915. Les octrois en 1914. Allemagne : Prix moyens des principaux articles de consommation, dans les provinces prussiennes, de janvier á mars des années 1916, 1915 et 1914. Italie : Finances de guerre. Russie : Le budget de l'exercice 1916.

August, 1916—Les indices economiques. Russie : Loi de l'impôt gouvernemental sur le revenu (6 avril 1916).

September, 1916—États-Unis. L'activité économique des États-Unis depuis 1912.

October, 1916—Allemagne : Le cheptel (lease of cattle) allemand à la fin de décembre 1915 et 1914.

Journal des Economistes—

August, 1916—Second manifeste de la Ligue du Libre-échange. Memorandum sur le libre-échange. La Finance internationale : *Guyot* (*Yves*). Les Forêts de la Russie et les perspectives de leur exploitation dans un avenir prochain dans le but d'exporter le bois à l'étranger : *Faas* (*W.*). Les Ports maritimes de France en 1914 et 1915 : *Pawlowski* (*Auguste*). Faut-il accroître la durée des brevets d'invention ? : *Jacq* (*Fernand*). Italie. Les Dettes publiques après la guerre. Espagne. Le Problème des frets et la junte des transports maritimes. Les entrepôts francs : *M.* (*P. de*).

September, 1916—Les Chemins de fer et la guerre : *Bellet* (*Daniel*). Le Mouvement international des aliments concentrés pour le bétail. L'Allemagne et le Commerce international des métaux : *Raffalovich* (*Arthur*). Les Ports français pendant la guerre. (1914–15) : *Pawlowski* (*Auguste*). La Banque néerlandaise en 1915–1916 : *A.R.* Les Prisons et la Guerre : *Nouvion* (*Georges de*).

October, 1916—Leçons du passé : *Guyot* (*Yves*). Le Maroc économique : *Bernard* (*François*). L'Approvisionnement de Paris : *Schelle* (*G.*). L'Emprunt 5p 100 français de 1916 : *Barriol* (*A.*). Les Finances de l'Empire allemand : *Raffalovich* (*A.*). Les Chemins de fer et la guerre : *Bellet* (*Daniel*).

FRANCE—*Contd.*

Journal des Economistes—Contd.

November, 1916—Leçons du passé. Le Congrès de Vienne: *Guyot* (*Yves*). The British Trade Bank: *Raffalovich.* A propos de l'alcoolisme: *Schelle* (*G.*). Note sur le calcul du taux réel de l'emprunt 5p 100 de la Guerre franco-allemande 1870 71: *Barriol.* Le Maroc économique: *Bernard* (*François*). Le Commerce international après la guerre: *A.R.* Le Rôle de l'or dans une période de guerre: *Guilmard* (*M.*).

December, 1916—Caractère des placements français avant la guerre: *Guyot* (*Yves*). La Situation des inventeurs pendant la guerre: *Jacq* (*Fernand*). L'Australie en 1915–1916: *Gouvy* (*L.*). La Loi du 31 mai 1916 restreignant le droit d'émission des valeurs mobilières: *Tchernoff* (*I.*). Les Modifications possibles à la législation des brevets. *Bourdil* (*F.*).

Journal de la Société de Statistique de Paris—

July, 1916—Le Japon, notre ami et notre allié: *Girard* (*Joseph*). Statistique internationale des valeurs mobilières: *Neymarck* (*Alfred*). La population et les lois électorales en France, de 1789 à nos jours: *Meuriot* (*Paul*).

August–September, 1916—Le revenu domanial des États allemands: *Meuriot* (*Paul*). La population et les lois électorales en France, de 1789 à nos jours: *Meuriot* (*Paul*).

October, 1916—La douane et la guerre: *Magnan* (*L.*). La balance économique de la France en 1912 et 1915: *Pupin* (*René*).

November, 1916—L'Allemagne de demain: *Chervin* (*A.*). La richesse mobilière des Français au début de 1916: *Pupin* (*René*). Du calcul de la population par feux: *Meuriot* (*Paul*).

December, 1916—De la méthode statistique dans les sciences expérimentales: *Richet* (*Ch.*). L'Allemagne de demain: *Chervin* (*A.*).

La Réforme Sociale—

July, 1916—La famille française au lendemain de la guerre (Papers by different authors.)

August, 1916—La famille et la loi du travail: *Nicolle* (*Louis*). Histoire d'un reformateur: Robert Owen: *Clément* (*Henry*).

September, 1916—La famille et la conservation du patrimoine: *Ardant* (*Gabriel*). La dépopulation et la crise agricole après la guerre: *Riballier* (*Louis*).

October, 1916—La famille et la legislation fiscale: *Maroussem* (*P. du*). Les familles terriennes et l'impôt progressif sur les successions: *Mascarel* (*A.*). Les soldats aveugles et l'agriculture.

November, 1916—Les lois contre la famille: Les réformes nécessaires: *Massabuau* (*M. J.*). Esprit scientifique et sociologie: *Arendt* (*Ch.*).

December, 1916—Le problème de la vie chère et les familles nombreuses: *Beaucourt* (*Marquis de*). Le mouvement antiallemand en France: *Mesnil-Thoret* (*Simon du*).

FRANCE—*Contd.*

Revue des Nations Latines—

September, 1916—La sericiculture en France et en Italie : *Bellet* (*D.*). La guerre sur mer et ses nouvelles armes : *Bolina* (*J. la*).

October, 1916—Les routes latines : *Polier* (*Leon*). Serbes et slaves meridionaux : *Caprin* (*G.*).

November, 1916—Pour les travailleurs italiens en France. (1) : *Agnelli* (*A.*).

December, 1916—Un demi siècle de civilisation française : *Levy* (*Raphael Georges*).

ITALY—

Giornale degli Economisti e Rivista di Statistica—

July, 1916—I contadini di Troja (Foggia) secondo l'Inchiesta parlamentare : *Curato* (*Giulio*). La politica commerciale italiana e i effetti sull'economia nazionale : *Fraschetti* (*Armando*). Contributo al metodo delle minime differenze : *Amoroso* (*Luigi*).

August, 1916—Problemi finanziari della guerra : *Cabiati* (*Attilio*). Pagine staccate : *L. O.* Questioni di economia teorica relative alla guerra : *Vecchio* (*Gustavo del*).

September, 1916—Indici economici : *M.* La politica commerciale italiana e i soui effetti sull' economia nazionale : *Fraschetti* (*Armando*). L'insegnamento della statistica nel passato e nell' avvenire : *Salvioni* (*G. B.*).

October, 1916—Germanesimo ed Americanesimo : *Massuero* (*F. Nobili*). La pressione tributaria sulle societa per azioni in Italia : *Griziotti* (*Benvenuto*). Sull' evasione nelle trasmissioni a titolo gratuito : *Contento* (*Aldo*).

November, 1916—Relazioni fra sconto e prezzi durante i cicli economici : *Turroni* (*C. B.*). Le tasse del Canale di Suez e la guerra : *Blessich* (*Aldo*). Nota sui risultati complessivi e sulla participazione regionale ai prestiti nazionale : *Cesari* (*Emidio*).

La Riforma Sociale—

August–September–October, 1916 — Lineamenti della politica granaria moderna : *Garino-Canina* (*A.*). I profitti industriali e la pressione fiscale : *Borgatta* (*Gino*). Sul frazionamento dei terreni e l'intensificazione della cultura : *Friedmann* (*Gino*).

November–December, 1916—Qualche aspetto economico del problema idraulico. : *Jannaccone* (*P.*). Sulle piu riposte armonie fra l'economia e la morale : *Billia* (*Michelangelo*). Forze economiche e forze morali nella restaurazione postbellica : *Prato* (*Giuseppe*). Di alcune verità economiche dimostrate dalla guerra : *Garino-Canina* (*Attilio*). Alcune considerazioni sul limite dei prestiti bellici e dei consumi di guerra : *Nictora* (*Giovanni*). Per il buon senso e per non togliere le armi all' esercito in campo : *Einaudi* (*Luigi*) e *Geisser* (*Alberto*).

Rivista Italiana di Sociologia. *May–August*, 1916—Un precursore del mendelismo storico : *Ratto* (*L.*). Intorno all' influenza del mese di nascita : *Boldrini* (*M.*). Il concetto di reddito in finanza ed in economia pura : *Lolini* (*E.*). L'ammontare e la composizione della ricchezza in Italia e nelle sue regioni : *Savorgnan* (*F.*).

LIST OF ADDITIONS TO THE LIBRARY.

During the period that has elapsed since July, 1916, the Society has received the publications enumerated below.

Note.—Periodical publications are not included in this list, but they will be acknowledged at the end of the volume.

(a) Foreign Countries.

Argentine Republic—

Extracto Estadistico de la Republica Argentina. Correspondiente al ano 1915. 8vo. 1916. (Direccion General de Estadistica.)

Chile—

Sinopsis Estadistica de la Republica de Chile. 8vo. 1916. (Oficina Central de Estadistica.)

Denmark—

Communications Statistiques. 4me serie. Tome 51. 1. La population de Danemark au 1er février 1916. 2. Salaires des ouvriers domestiques ou journaliers de l'agriculture 1915. 3. Productions contrôlées 1915. 8vo. 1916. (Statistiske Departement.)

France—

Census. Résultats Statistiques du Recensement Général de la population, 5 mars 1911. Tome 1. 2e Partie. Population présente totale. 4to. 1916. (Le Chef du Service de la Statistique Générale de France.)

Marseilles. Les Zones Franches et l'Exportation Française. Documents et Arguments réunis par la Chambre de Commerce de Marseille. 254 pp., 8vo. Paris, 1916. (Librairie Felix Alcan.)

Italy—

Education. Notizie sommarie su gli Istituti per l'istruzione media e normale negli anni scolastici dal 1909–10 al 1911–12. 8vo. 1916. (Ministero di Agricoltura.)

The War in Italy. Vol. 1. On the High Mountains. Vol. 2. The Carso. Vol. 3. The Battle between the Brenta and the Adige. 3 vols. of photographs, 4to. Milan, 1916. (Banca Commerciale Italiana.)

Netherlands—

Deaths. Bijvoegsel bij de Sterftestatistiek van 1914. Sterfe van kinderen beneden het naar de voornaamste doodsoorzaken, alsmede van het aantal levenloos aangegevenen, in total in de 5 jaren 1910–1914, met afzonderlijke vermelding, in klein lettertype, van de cijfers voir jet jaar 1911 (het jaar bij uitstek hooge kindersterfte). 24 pp., 4to. 1916. (Bureau Central de Statistique.)

Norway—

Juvenile Employment. Om Barns Erhvervs Maessige arbeide . . . 163 pp., 8vo. 1916. (Steen'ske Bogtrykkeri.)

Portugal—

Births, &c. Tabelas do Movimento Fisilogico da Populacao de Portugal. Decénio de 1901–1910. 187 pp., 8vo. [1916. (Instituto Central de Higiene.)

(a) **Foreign Countries**—*Contd.*

Russia—

The Russian Year-book, 1916. viii and 779 pp., 8vo. London, 1916. (Eyre and Spottiswoode, Ltd.)

Finland. Forestry. Statistique Forestière. Rapport de la Direction Générale Forestière sur la Sylviculture et l'Administration des Forêts de la Couronne, sur le Travail des Ecoles de Gardes Forestiers et sur la sylviculture des Fermes Domaniales Militaries, Civiles et Ecclesiastiques. 1912. vi and 465 pp., 8vo. 1915. (General Register Office, London.)

Sweden—

Dairies. Mejerihantering ar 1913. viii and 88 pp., 8vo. 1916. (Bureau Central de Statistique.)

Housing of Working Classes. Undersokningar Rorande de Mindre Bemedlades Bostadsforhallanden i vissa Sbenska Stader (Bostadsbeskrivningar) Norrkoping. 102 pp., 8vo. 1916. (University of Upsala.)

—— Belaning av Bostadsfastigheter i Sverige ar 1912. Vol. I. Text. Vol. II. Tabeller. 2 vols., 8vo. 1916. (Bostadskommissionens Utredningar.)

Labour Accidents. Olycksfall i Arbete aren 1910, 1911 och 1912 av K. Socialstyrelsen i Text. 123 pp., 8vo. 1916. (University of Upsala.)

Livestock. Husdjursrakningen den 1 Juni 1916. iv and 108 pp., 8vo. 1916. (Bureau Central de Statistique.)

Switzerland—

Bern (*Kanton*). Ergebnisse der viii schweizerischen Viehzählung vom 19 April 1916 im Kanton Bern. 82 pp., 8vo. 1916. (Kantonales Statistisches Bureau.)

United States—

Agriculture. Department of. Bulletin No. 384. Costs and Sources of Farm-Mortgage Loans in United States. 16 pp., 8vo. 1916. (The Department.)

—— Bulletin No. 746. The Farmer's Income. 7 pp., 8vo. 1916. (*Id.*)

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The Paris Conference Proposals. A Memorandum by the Cobden Club. 23 pp., 8vo. London, 1916. (Cobden Club.)

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Oxford University Press. General Catalogue. Nov., 1916. viii + 566 pp., 8vo. London, 1916. (Humphrey Milford.)

Royal Geographical Society. The Investigation of Rivers. Final Report. 93 pp. and plates, 8vo. London, 1916. (The Society.)

Women's Industrial Council. Domestic Service. An Enquiry by the Women's Industrial Council. Report by C. V. Butler. With Supplementary Chapter by Lady Willoughby de Broke. 148 pp., sm 8vo. London, 1916. (Bell and Sons.)

SHIPPING.—(United Kingdom.)—*Account of Tonnage of Vessels Entered and Cleared with Cargoes, from and to Various Countries, during the* Years *ended Dec.*, **1916-15-14.**

Countries from whence Entered and to which Cleared.	Total British and Foreign.					
	1916.		1915.		1914.	
	Entered.	Cleared.	Entered.	Cleared.	Entered.	Cleared.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
FOREIGN COUNTRIES.						
Russia Northern ports	713,593	232,166	591,094	240,792	1,890,684	1,803,274
Russia Southern ,, ...	—	—	—	—	424,808	180,433
Russia Pacific ,, ...	59,775	24,087	91,316	59,284	55,468	60,838
Sweden	1,170,862	999,701	1,501,026	1,590,737	1,479,619	2,445,700
Norway	1,763,027	1,785,049	1,697,260	1,954,179	1,344,789	1,788,900
Denmark	383,988	1,456,299	413,599	1,985,336	521,488	2,027,735
Germany	—	—	2,039	—	1,534,236	3,317,554
Netherlands	805,500	1,304,364	1,314,283	1,971,484	2,828,612	3,010,230
Belgium	—	20	—	60	2,004,969	1,907,188
France	1,936,652	10,540,872	2,403,887	10,676,412	3,689,283	8,338,671
Spain	3,056,467	1,616,259	2,854,963	1,476,255	2,615,793	1,885,294
Portugal	343,500	459,314	316,009	571,244	279,923	645,770
Italy	287,023	3,322,707	295,463	3,095,685	411,104	4,265,528
Austria-Hungary	—	—	—	—	70,822	330,107
Greece	117,013	102,393	131,237	221,108	143,519	307,416
Turkey	14,086	3,160	46,663	47,468	124,986	296,123
Roumania	—	—	—	—	244,033	181,099
Egypt	*	*	*	*	314,645	1,383,031
Algeria	458,763	411,241	433,282	519,615	422,522	497,663
Portuguese East Africa	71,487	126,007	108,086	169,640	246,935	263,111
United States of America	7,768,663	4,343,678	7,843,543	3,894,909	8,061,467	6,222,598
Mexico, Foreign W. Indies, and Central America	523,292	201,675	535,947	300,664	556,883	474,216
Colombia	31,955	7,467	133,213	18,692	99,690	40,276
Brazil	181,530	270,644	167,275	464,469	311,098	897,063
Peru	88,648	116,954	145,959	108,605	227,829	185,597
Chile	359,956	84,399	245,996	87,688	168,511	369,655
Uruguay	41,356	106,301	18,709	172,965	36,188	290,748
Argentine Republic	1,568,136	1,249,392	2,546,564	1,927,303	2,234,655	2,923,418
China	90,892	40,902	91,140	40,835	72,233	78,650
Java	254,154	144,367	306,307	292,305	361,817	318,927
Japan	462,928	451,683	538,580	531,002	525,827	668,838
Other countries	755,587	529,424	741,163	706,246	845,719	724,539
Total, Foreign Countries.	23,308,835	29,930,525	25,514,603	33,124,982	34,150,155	48,130,190
BRITISH POSSESSIONS.						
British North America	1,855,717	1,347,032	2,303,161	1,358,082	3,088,398	2,119,639
British India	1,752,961	1,124,066	2,056,123	1,205,605	1,903,799	1,620,087
Mauritius, Ceylon, Straits Settlements, & Hong Kong	118,951	137,677	186,960	133,396	161,631	294,407
Australia	994,465	692,604	1,113,230	884,647	1,454,359	1,174,963
New Zealand	334,215	261,055	407,714	329,914	421,716	428,794
West Indies	142,189	99,310	165,592	60,117	214,731	108,980
Channel Islands	275,702	292,518	369,541	348,494	520,430	419,047
Gibraltar and Malta	35,434	293,860	73,412	251,319	76,437	315 987
Egypt	365,908	539,774	504,579	843,113	†	†
Union of South Africa	316,739	350,533	389,642	441,024	423,153	698,033
Other possessions	558,312	527,800	639,347	548,669	645,974	658,442
Total, British Possessions	6,750,593	5,666,229	8,209,301	6,404,380	8,910,628	7,838,379
TOTAL FOREIGN COUNTRIES AND BRITISH POSSESSIONS.						
Twelve Months ended December, 1916	30,059,428	35,596,754	—	—	—	—
Twelve Months ended December, '15	—	—	33,723,904	39,529,362	—	—
Twelve Months ended December, '14	—	—	—	—	43,060,783	55,968,569

* *See under* "British Possessions." † *See under* "Foreign Countries."

Values of **Imports** *into the United Kingdom for the Years* **1914-15-16.***

[From the Monthly Trade Returns, December, 1916.]

	Year ended December 31,			Increase (+) or Decrease(−) in 1916 as Compared with 1915.	Increase (+) or Decrease(−) in 1916 as Compared with 1914.
	1914.	1915.	1916.		
I. FOOD, DRINK, AND TOBACCO—	£	£	£	£	£
A. Grain and flour	79,636,269	112,357,768	133,306,944	+20,949,176	+53,670,675
B. Meat, including animals for food	63,215,056	86,839,086	91,058,437	+ 7,219,351	+30,843,381
C. Other food and drink—					
(1.) Non-dutiable	78,611,719	91,460,222	93,998,047	+ 2,537,825	+15,386,328
(2.) Dutiable	68,043,095	81,667,856	90,781,678	+ 9,113,822	+22,738,583
D. Tobacco	7,463,068	8,549,629	7,394,580	− 1,155,049	− 68,488
Total, Class I	296,969,207	380,874,561	419,539,686	+38,665,125	+122,570,479
II. RAW MATERIALS AND ARTICLES MAINLY UNMANUFACTURED—					
A. Coal, coke, and manufactured fuel	41,924	10,733	8,215	− 2,518	− 33,709
B. Iron ore, scrap iron, and steel	5,487,344	7,544,601	12,087,309	+ 4,512,708	+ 6,599,965
C. Other metallic ores	9,533,465	11,574,185	13,681,839	+ 2,107,654	+ 4,148,374
D. Wood and timber	25,343,111	32,788,324	40,199,469	+ 7,411,145	+14,856,358
E. Cotton	55,350,626	64,671,623	84,729,677	+20,058,054	+29,379,051
F. Wool	34,246,722	44,146,533	39,766,623	− 4,379,910	+ 5,519,901
G. Other textile materials	15,367,670	21,022,749	23,883,630	+ 2,860,881	+ 8,515,960
H. Oil seeds, nuts, oils, fats, and gums	41,332,056	49,669,393	63,391,596	+13,722,203	+22,059,540
I. Hides and undressed skins	12,727,066	13,958,967	13,869,037	− 89,930	+ 1,141,971
J. Paper-making materials	5,958,215	6,151,851	8,132,100	+ 1,980,249	+ 2,173,885
K. Miscellaneous	31,143,184	35,030,592	37,236,547	+ 2,205,955	+ 6,093,363
Total, Class II.	236,531,383	286,569,551	336,986,042	+50,416,491	+100,454,659
III. ARTICLES WHOLLY OR MAINLY MANUFACTURED—					
A. Iron and steel and manufactures thereof	10,877,249	10,805,808	11,221,027	+ 415,219	+ 343,778
B. Other metals and manufactures thereof	29,604,332	42,215,798	39,037,206	− 3,178,592	+ 9,432,874
C. Cutlery, hardware, implements (except machine tools), and instruments	5,194,203	4,929,131	5,706,548	+ 777,417	+ 512,345
D. Electrical goods and apparatus (other than machinery and uninsulated wire)	1,242,770	1,096,223	1,652,763	+ 556,540	+ 409,993
E. Machinery	6,712,499	8,847,910	7,992,537	− 855,373	+ 1,280,038
F. Ships (new)	31,930	157,256	14,425	− 142,831	− 17,505
G. Manufactures of wood and timber (including furniture)	2,336,918	2,324,624	1,956,043	− 368,581	− 380,875
H. Yarns and textile fabrics—					
(1.) Cotton	9,373,309	7,555,060	8,309,015	+ 753,955	− 1,064,294
(2.) Wool	7,648,409	1,724,585	923,241	− 801,344	− 6,725,168
(3.) Silk	13,392,844	14,637,943	13,149,219	− 1,488,724	− 243,625
(4.) Other materials	7,353,124	9,042,768	11,202,998	+ 2,160,230	+ 3,849,874
I. Apparel	4,252,750	2,956,150	2,731,542	− 224,608	− 1,521,208
J. Chemicals, drugs, dyes, and colours	12,064,430	19,329,020	28,663,449	+ 9,334,429	+16,599,019
K. Leather and manufactures thereof (including gloves, but excluding boots and shoes)	13,478,148	17,034,389	16,211,219	− 823,170	+ 2,733,071
L. Earthenware and glass	2,991,307	2,175,990	3,053,254	+ 877,264	+ 58,947
M. Paper	6,791,191	6,647,268	8,328,846	+ 1,681,578	+ 1,537,665
N. Railway carriages and trucks (not of iron), motor cars, cycles, carts, &c.	7,266,894	9,144,748	5,981,128	− 3,163,620	− 1,285,766
O. Miscellaneous	19,874,909	20,825,517	23,138,916	+ 2,313,369	+ 3,264,007
Total, Class III	160,490,216	181,450,218	189,273,376	+ 7,823,158	+28,783,160
IV. MISCELLANEOUS AND UNCLASSIFIED (including parcel post)	2,644,307	2,999,020	3,353,575	+ 354,555	+ 709,268
Total	696,635,113	851,893,350	949,152,679	+97,259,329	+252,517,566

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* The values of the imports represent the cost, insurance, and freight; or, when goods are consigned for sale, the latest sale value of such goods.

Values of **Exports** *of British and Irish Produce and Manufactures for the Years* **1914-15-16.*** [From the Monthly Trade Returns, December, 1916.]

	Year ended December 31,			Increase (+) or Decrease(–) in 1916 as Compared with 1915.	Increase (+) or Decrease(–) in 1916 as Compared with 1914.
	1914.	1915.	1916.		
	£	£	£	£	£
I. FOOD, DRINK, AND TOBACCO—					
A. Grain and flour	3,095,080	3,858,927	2,776,059	– 1,082,868	– 319,021
B. Meat, including animals for food	1,139,362	1,342,673	1,242,294	– 100,379	+ 102,932
C. Other food and drink	19,006,084	16,088,190	20,710,329	+ 4,622,139	+ 1,704,245
D. Tobacco	3,708,016	3,791,879	4,766,970	+ 975,091	+ 1,058,954
Total, Class I.	26,948,542	25,081,669	29,495,652	+ 4,413,983	+ 2,547,110
II. RAW MATERIALS AND ARTICLES MAINLY UNMANUFACTURED—					
A. Coal, coke, and manufactured fuel	42,202,128	38,824,223	50,670,604	+11,846,381	+ 8,468,476
B. Iron ore, scrap iron, and steel	298,196	196,870	301,126	+ 104,256	+ 2,930
C. Other metallic ores	109,745	21,852	20,352	– 1,500	– 89,393
D. Wood and timber	277,328	199,977	308,957	+ 108,980	+ 31,629
E. Cotton	...	...	...	...	...
F. Wool	4,469,090	3,846,442	3,682,944	– 163,498	– 786.146
G. Other textile materials	417,723	460,185	576,076	+ 115,891	+ 158,353
H. Oil seeds, nuts, oils, fats, and gums	3,962,292	5,391,728	4,593,744	– 797,984	+ 631.452
I. Hides and undressed skins	1,483,108	890,918	1,528,460	+ 637,542	+ 45,352
J. Paper-making materials	845,057	668,403	538,929	– 129,474	– 306,128
K. Miscellaneous	2,648,415	1,853,442	2,121,459	+ 268,017	– 526,956
Total, Class II.	56,713,082	52,354,040	64,342,651	+11,988,611	+ 7,629.569
III. ARTICLES WHOLLY OR MAINLY MANUFACTURED—					
A. Iron and steel and manufactures thereof	41,667,830	40,406,196	56,681,770	+16,275,574	+15,013,940
B. Other metals and manufactures thereof	10,283,283	9,701,763	12,720,656	+ 3,018,893	+ 2,437,373
C. Cutlery, hardware, implements (except machine tools), and instruments	6,512,218	5,060,388	6,431,420	+ 1,371,032	– 80,798
D. Electrical goods and apparatus (other than machinery and uninsulated wire)	3,018,600	3,168,642	4,107,232	+ 938,590	+ 1,088,632
E. Machinery	31,363,093	19,164,537	20,231,374	+ 1,066,837	–11,131,719
F. Ships (new)	6,932,554	1,692,661	1,290,575	– 402,086	– 5,641,979
G. Manufactures of wood and timber (including furniture)	1,564,388	1,041,446	1,278,695	+ 237,249	– 285,693
H. Yarns and textile fabrics—					
(1.) Cotton	103,266,538	85,918,754	118,442.740	+32,523,986	+15,176,202
(2.) Wool	31,499,885	32,839,615	46,900,926	+14,061.311	+15,401,041
(3.) Silks	1,865,573	1,700,093	2,405,583	+ 705,490	+ 540,010
(4.) Other materials	12,982,261	11,713,793	15,817,002	+ 4,103,209	+ 2,834,741
I. Apparel	14,531,674	11,603,838	16,940,411	+ 5,336,573	+ 2,408,737
J. Chemicals, drugs, dyes, and colours	19,508,061	22,068,563	27,676,841	+ 5,608,278	+ 8,168,780
K. Leather and manufactures thereof (including gloves, but excluding boots and shoes)	4,685,015	3,798,154	4,894,705	+ 1,096,551	+ 209,690
L. Earthenware and glass	4,147,640	3,298,238	3,917,313	+ 619,075	– 230,327
M. Paper	3,185,939	2,995,127	5,198,942	+ 2,203,815	+ 2,013,003
N. Railway carriages and trucks (not of iron), motor cars, cycles, carts, &c.	11,229,558	6,578,013	8,040,287	+ 1,462,274	– 3,189,271
O. Miscellaneous	30,389,454	30,176,964	40,693,634	+10.516,670	+10,304,180
Total, Class III	338,633,564	292,926,785	393,670,106	+ 100,743,321	+55,036,542
IV. MISCELLANEOUS AND UNCLASSIFIED (including parcel post)	8,426,169	14,505,954	19,037,803	+ 4,531,849	+10,611,634
Total	430,721,357	384,868,448	506,546,212	+121,677,764	+75,824,855

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* The values of the exports represent the cost and the charges of delivering the goods on board the ship, and are known as the "free on board" values.

REVENUE OF THE UNITED KINGDOM.

Net Produce in Quarters in 1916, *and in Financial Years ended March* 31, 1915-16, 1914-15, 1913-14, 1912-13.

[000's omitted.]

QUARTERS, ended	March 31, 1916.	June 30, 1916.	September 30, 1916.	December 31, 1916.	Total for Calendar Year 1916.
	£	£	£	£	£
Customs	21,082,	16,162,	15,951,	18,830,	72,025,
Excise	16,779,	11,571,	13,349,	16,570,	58,269,
Stamps and estate duties	8,995,	9,228,	9,425,	8,631,	36,279,
Taxes (Land Tax and House Duty)	2,280,	300,	20,	90,	2,690,
Post Office	7,730,	4,550,	6,750,	5,200,	24,230,
Telephone Service	1,870,	1,650,	1,450,	1,500,	6,470,
Telegraph Service	1,200,	800,	800,	900,	3,700,
	59,936,	44,261,	47,745,	51,721,	203,663,
Property and Income Tax, including Super-tax	102,425,	20,203,	14,602,	17,588,	154,818,
	162,361,	64,464,	62,347,	69,309,	358,481,
Land value duties	291,	70,	41,	40,	442,
Crown Lands	170,	110,	130,	230,	640,
Interest on Advances	1,656,	13,	2,368,	2,441,	6,478,
Miscellaneous	5,032,	8,026,	26,354,	57,198,	96,610,
Totals	169,510,	72,683,	91,240,	129,218,	462,651,

YEARS, ended March 31,	1915-16.	1914-15.	1915-16.		Corresponding Years.	
			Less.	More.	1913-14.	1912-13.
	£	£	£	£	£	£
Customs	59,606,	38,662,	—	20,944,	35,450,	33,485,
Excise	61,210,	42,313,	—	18,897,	39,590,	38,000,
Stamps and estate duties	37,799,	35,959,	—	1,840,	37,325,	35,307,
Taxes (Land Tax and House Duty)	2,650,	2,560,	—	90,	2,700,	2,700,
Post Office	24,100,	20,400,	—	3,700,	21,190,	20,300,
Telephone Service	6,450,	6,250,	—	200,	6,530,	3,775,
Telegraph Service	3,350,	3,000,	—	350,	3,080,	3,100,
	195,165,	149,144,	—	46,021,	145,865,	138,667,
Property and Income Tax, including Super-tax	128,320,	69,399,	—	58,921,	47,249,	44,806,
	323,485,	218,543,	—	104,942,	193,114,*	183,473,
Land value duties	363,	412,	49,	—	—	—
Crown Lands	550,	545,	—	5,	530,	530,
Interest on Advances	2,432,	1,277,	—	1,156,	1,580,	1,419,
Miscellaneous	9,937,	5,917,	—	4,020,	2,304,	2,925,
Totals	336,767,	226,694,	49,	110,123,	197,528,*	188,347,*
			NET INC. £110,074.			

* Excluding Land Value Duties.

BANK OF ENGLAND.

Pursuant to the Act 7th and 8th Victoria, cap. 32 (1844),

[0,000's omitted.]

1	2	3	4	5	6	7
Issue Department.					Collateral Columns.	
Liabilities.		Assets.				
Notes Issued.	Dates. (Wednesdays.)	Government Debt.	Other Securities.	Gold Coin and Bullion.	Notes in Hands of Public. (Col. 1 minus col. 16.)	Minimum Rates of Discount at Bank of England.
£ Mlns.	1916.	£ Mlns.	£ Mlns.	£ Mlns.	£ Mlns.	Per cent.
69,37	Jan. 5	11,02	7,43	50,92	35,19	5
69,47	,, 12	11,02	7,43	51,02	34,34	
69,39	,, 19	11,02	7,43	50,94	33,91	
70,23	,, 26	11,02	7,43	51,78	33,82	
70,74	Feb. 2	11,02	7,43	52,30	34,20	
72,15	,, 9	11,02	7,43	53,70	32,87	
72,61	,, 16	11,02	7,43	54,16	32,57	
72,67	,, 23	11,02	7,43	54,22	32,51	
73,68	Mar. 1	11,02	7,43	55,23	33,31	
73,55	,, 8	11,02	7,43	55,10	33,10	
72,67	,, 15	11,02	7,43	54,22	32,91	
73,54	,, 22	11,02	7,43	55,09	32,90	
74,17	,, 29	11,02	7,43	55,72	33,58	
73,90	April 5	11,02	7,43	55,45	33,87	
75,30	,, 12	11,02	7,43	56,85	33,66	
75,35	,, 19	11,02	7,43	56,90	34,03	
76,30	,, 26	11,02	7,43	57,85	34,10	
74,79	May 3	11,02	7,43	56,34	34,33	
76,63	,, 10	11,02	7,43	58,18	34,43	
77,26	,, 17	11,02	7,43	58,81	34,67	
77,14	,, 24	11,02	7,43	58,69	34,74	
77,29	,, 31	11,02	7,43	58,84	35,39	
77,58	June 7	11,02	7,43	60,13	35,48	
78,43	,, 14	11,02	7,43	59,99	35,36	
78,42	,, 21	11,02	7,43	59,97	35,22	
77,99	,, 28	11,02	7,43	59,54	35,90	
76,77	July 5	11,02	7,43	58,32	36,37	
75,76	,, 12	11,02	7,43	57,31	35,99	6
73,34	,, 19	11,02	7,43	54,89	35,96	
72,80	,, 26	11,02	7,43	54,35	36,05	
71,36	Aug. 2	11,02	7,43	52,91	36,66	
73,03	,, 9	11,02	7,43	54,58	36,15	
74,00	,, 16	11,02	7,43	55,55	35,71	
73,70	,, 23	11,02	7,43	55,25	35,34	
72,85	,, 30	11,02	7,43	54,40	36,15	
72,03	Sept. 6	11,02	7,43	53,58	36,26	
71,42	,, 13	11,02	7,43	52,97	36,12	
71,26	,, 20	11,02	7,43	52,81	35,97	
70,20	,, 27	11,02	7,43	51,75	36,54	
71,24	Oct. 4	11,02	7,43	52,79	37,06	
72,27	,, 11	11,02	7,43	53,82	36,85	
72,99	,, 18	11,02	7,43	54,54	36,67	
72,63	,, 25	11,02	7,43	54,18	36,69	
72,88	Nov. 1	11,02	7,43	54,43	37,22	
73,04	,, 8	11,02	7,43	54,59	37,17	
72,98	,, 15	11,02	7,43	54,53	36,89	
73,02	,, 22	11,02	7,43	54,57	36,92	
72,73	,, 29	11,02	7,43	54,28	37,66	
72,68	Dec. 6	11,02	7,43	54,23	37,86	
71,91	,, 13	11,02	7,43	53,46	37,96	
71,91	,, 20	11,02	7,43	53,46	37,96	
71,29	,, 27	11,02	7,43	52,84	39,68	

—WEEKLY RETURN.

for Wednesday in each Week, during the Year 1916.

[0,000's omitted.]

8	9	10	11	12	13	14	15	16	17	18
BANKING DEPARTMENT.										
Liabilities.						Assets.				Totals of Liabilities and Assets.
Capital and Rest.		Deposits.		Seven Day and other Bills.	DATES. (Wednesdays.)	Securities.		Reserve.		
Capital.	Rest.	Public.	Private.			Government.	Other.	Notes.	Gold and Silver Coin.	
£ Mlns.	£ Mlns.	£ Mlns.	£ Mlns.	£ Mlns.	1916.	£ Mlns.	£ Mlns	£ Mlns.	£ Mlns.	£ Mlns.
14,55	3,38	58,17	105,84	,2	Jan. 5	32,84	114,75	34,18	,18	181,95
14,55	3,41	53,55	104,08	,2	„ 12	32,84	107,36	35,13	,28	175,61
14,55	3,45	59,47	100,78	,2	„ 19	32,84	109,72	35,48	,23	178,27
14,55	3,48	62,88	100,96	,2	„ 26	32,84	112.20	36,40	,45	181,89
14,55	3,50	58,25	98,58	,4	Feb. 2	32,84	105,14	36,54	,40	174,92
14 55	3,52	62,64	100,49	,3	„ 9	32,84	108,53	39,28	,58	181,23
14,55	3,44	51 51	90,16	,3	„ 16	32,84	95,15	40,05	,65	168,70
14 55	3,51	52.62	96,39	,2	„ 23	32,84	93,34	40,16	,77	167,11
14,55	3,61	50,63	102,02	,2	Mar. 1	32,84	96,74	40,38	,88	170,83
14.55	3,66	52.17	97,04	,2	„ 8	32,84	93,18	40,44	,98	167,44
14,55	3,68	52.40	95,28	,2	„ 15	32,84	92,43	39,76	,91	165,94
14,55	3,72	56,22	90,13	,2	„ 22	32,84	90,27	40,64	,88	164,63
14.55	3,73	57.06	87,36	,2	„ 29	32,84	88,35	40,59	,94	162,72
14,55	3,13	69,91	87,75	,2	April 5	33,19	96,14	40,02	1,02	175,37
14,55	3,10	68,80	79,96	,3	„ 12	33,19	90,54	41,64	1,08	166,45
14,55	3,08	59,18	86,65	,2	„ 19	33,19	87,91	41,32	1,07	163,48
14.55	3,09	61,72	85,47	,2	„ 26	33,19	88,40	42,20	1,07	164,86
14,55	3,10	48,44	86,02	,3	May 3	33,19	77,38	40,45	1,13	152,15
14,55	3,12	54,83	85,44	,3	„ 10	33,19	79,41	42,20	1,18	155,98
14,55	3,14	60,65	78,58	,2	„ 17	33,19	79,88	42,59	1,29	156,94
14,55	3,14	54,25	81,41	,2	„ 24	33.19	76,45	42,40	1,34	153,37
14,55	3,14	53,53	82,86	,3	„ 31	38,19	72,65	41,90	1,38	154,12
14,55	3,16	50,30	82,29	,2	June 7	42,19	63,60	43,09	1,44	150,33
14.55	3,17	52,26	87,54	,3	„ 14	42,19	70,70	43,08	1,59	157,56
14,55	3,18	51,20	91,55	,3	„ 21	42,19	73,38	43,21	1,74	160,51
14,55	3,20	49,28	106,37	,3	„ 28	42,1	87,31	42,09	1,84	173,43
14,55	3,26	58,95	106,61	,3	July 5	42,19	95,81	40,41	2,00	180,40
14,55	3,26	54,92	92,50	,4	„ 12	42,19	81,23	39,77	2,09	165,27
14,55	3,32	58.07	86,44	,3	„ 19	42,19	80,79	37,38	2,06	162.42
14,55	3,37	52,99	85,24	,3	„ 26	42,19	75,22	36,76	2,02	156,19
14,55	3,41	51,01	85,52	,3	Aug. 2	42,19	75,66	34,70	1,97	154,52
14,55	3,48	54,63	88,99	,3	„ 9	42,19	80,64	36,88	1,97	161,68
14,55	3,49	54,22	93,86	,3	„ 16	42,19	83,81	38,29	1,87	166,16
14,55	3,54	51,43	101,75	,2	„ 23	42,19	89,05	38,17	1,89	171,30
14,55	3,55	52.36	102,14	,2	„ 30	42,19	91,94	36,70	1,79	172.63
14,55	3,57	52,22	105,09	,2	Sept. 6	42,19	95,73	35,77	1,76	175,45
14,55	3,57	59,15	96,38	,2	„ 13	42,19	94,46	35,30	1,73	173.67
14,55	3,60	52,99	104,19	,2	„ 20	42,19	96,10	35,29	1,77	175.35
14,55	3,61	53,37	101,48	,2	„ 27	42,19	95,39	33,66	1,80	173,04
14,55	3,16	52,24	117,40	,2	Oct. 4	42,19	109,17	34,17	1,84	187,37
14,55	3,18	55.14	109,36	,3	„ 11	42,19	102,77	35,41	1,88	182.25
14,55	3,16	55,59	108,50	,2	„ 18	42,19	101,39	36,32	1,92	181,81
14,55	3,17	52,54	112,17	,2	„ 25	42,19	102,44	35,94	1.89	182.46
14,55	3,19	51,11	116,62	,2	Nov. 1	42,19	105,71	35,65	1,94	185,49
14.55	3,22	51,60	111,25	,2	„ 8	42,19	100,68	35,87	1,91	180,64
14,55	3,22	53,74	114,92	,2	„ 15	42,19	106,23	36,08	1,95	186,45
14,55	3,19	55,58	105,42	,2	„ 22	42,19	98,63	36,10	1,84	178,76
14,55	3,22	56.24	109,27	,2	„ 29	42,19	104,27	35,08	1,76	183,30
14,55	3,24	58,72	108,95	,2	Dec. 6	42,19	106,75	34,82	1,71	185,47
14,55	3,23	57,51	106,53	,2	„ 13	42,19	104.06	33,95	1,64	181,85
14,55	3,23	57,51	106,53	,2	„ 20	42,19	104,06	33,95	1,64	181,85
14,55	3,10	52,12	126,73	,2	„ 27	57,19	106,46	31,61	1,46	196,73

FOREIGN EXCHANGES.—*Quotations as under,* LONDON *on Paris and Calcutta, and New York and Hong Kong on* LONDON, *for* **1916.**

1	2	3		4		5	6		7		8	
		Calcutta.							Price per Ounce.			
DATES. (Tuesdays or nearest Dates.)	London on Paris. 3 m. d.	London on Calcutta. Demand.		Indian Council Bills. Minimum Price per Rupee.		New York on London. 60 d. s.	Hong Kong on London. 4 m. d.*		Gold Bars (Fine).		Standard Silver in Bars.	
1916.		*s.*	*d.*	*s.*	*d.*	$	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*
Jan. 5	27·76	1	$4\frac{1}{8}$	1	$4\frac{1}{16}$	$4·75\frac{3}{4}$	1	$11\frac{3}{16}$	77	9	2	$2\frac{3}{4}$
„ 19	27·89	1	$4\frac{5}{32}$	1	$4\frac{3}{32}$	$4·76\frac{3}{4}$	1	$11\frac{1}{4}$	77	9	2	$2\frac{7}{8}$
Feb. 2	28·00	1	$4\frac{3}{16}$	1	$4\frac{3}{32}$	$4·76\frac{3}{16}$	1	$11\frac{5}{16}$	77	9	2	3
„ 16	27·97	1	$4\frac{3}{16}$	1	$4\frac{3}{32}$	$4·76\frac{1}{2}$	1	$11\frac{3}{16}$	77	9	2	$2\frac{13}{16}$
Mar. 1	27·99	1	$4\frac{3}{16}$	1	$4\frac{3}{32}$	4·77	1	$11\frac{3}{16}$	77	9	2	$2\frac{15}{16}$
„ 15	$28·18\frac{1}{2}$	1	$4\frac{3}{16}$	1	$4\frac{3}{32}$	$4·76\frac{7}{8}$	1	$11\frac{3}{8}$	77	9	2	3
„ 29	28·42	1	$4\frac{3}{16}$	1	$4\frac{3}{32}$	4·77	2	$0\frac{1}{16}$	77	9	2	$4\frac{11}{16}$
Apl. 12	28·75	1	$4\frac{1}{8}$	1	$4\frac{1}{32}$	4·77	2	$0\frac{11}{16}$	77	9	2	$5\frac{13}{16}$
„ 26	28·40	1	$4\frac{1}{8}$	1	$4\frac{1}{32}$	4·77	2	2	77	9	2	8
May 10	28·27	1	$4\frac{5}{32}$	1	$4\frac{3}{32}$	$4·76\frac{7}{16}$	2	$2\frac{7}{8}$	77	9	2	$11\frac{1}{16}$
„ 24	28·21	1	$4\frac{5}{32}$	1	$4\frac{3}{32}$	$4·76\frac{7}{16}$	2	$1\frac{7}{8}$	77	9	2	$10\frac{1}{6}$
June 7	28·15	1	$4\frac{1}{8}$	1	$4\frac{1}{16}$	$4·76\frac{7}{16}$	2	$0\frac{7}{8}$	77	9	2	$7\frac{15}{16}$
„ 21	$28·15\frac{1}{2}$	1	$4\frac{1}{8}$	—		$4·76\frac{7}{16}$	2	$1\frac{1}{8}$	77	9	2	$6\frac{5}{8}$
July 5	28·13	1	$4\frac{1}{8}$	1	$4\frac{1}{16}$	$4·76\frac{7}{16}$	2	$0\frac{3}{8}$	77	9	2	$6\frac{3}{4}$
„ 19	$28·12\frac{1}{2}$	1	$4\frac{1}{8}$	1	$4\frac{1}{16}$	$4·76\frac{1}{2}$	2	$0\frac{5}{8}$	77	9	2	$5\frac{1}{2}$
Aug. 2	28·13	1	$4\frac{3}{32}$	1	$4\frac{1}{32}$	$4·76\frac{7}{16}$	2	$1\frac{1}{8}$	77	9	2	$6\frac{1}{2}$
„ 16	28·16	1	$4\frac{1}{8}$	1	$4\frac{3}{32}$	$4·76\frac{7}{16}$	2	$1\frac{3}{8}$	77	9	2	$7\frac{3}{4}$
„ 30	$28·03\frac{1}{2}$	1	$4\frac{1}{8}$	—		$4·76\frac{7}{16}$	2	$1\frac{5}{8}$	77	9	2	$7\frac{13}{16}$
Sept. 13	27·89	1	$4\frac{5}{32}$	1	$4\frac{3}{32}$	$4·76\frac{7}{16}$	2	$1\frac{5}{8}$	77	9	2	$8\frac{5}{16}$
„ 27	$27·87\frac{1}{2}$	1	$4\frac{5}{32}$	1	$4\frac{3}{32}$	$4·76\frac{7}{16}$	2	$2\frac{3}{8}$	77	9	2	$8\frac{15}{16}$
Oct. 11	27·81	1	$4\frac{5}{32}$	1	$4\frac{3}{32}$	$4·76\frac{3}{8}$	2	$2\frac{1}{4}$	77	9	2	$8\frac{5}{16}$
„ 25	27·79	1	$4\frac{5}{32}$	1	$4\frac{3}{32}$	$4·76\frac{7}{16}$	2	$2\frac{3}{8}$	77	9	2	$8\frac{1}{8}$
Nov. 8	$27·79\frac{1}{2}$	1	$4\frac{5}{32}$	1	$4\frac{3}{32}$	$4·76\frac{7}{16}$	2	$3\frac{1}{2}$	77	9	2	$9\frac{7}{16}$
„ 22	27·79	1	$4\frac{5}{32}$	1	$4\frac{3}{32}$	$4·76\frac{7}{16}$	2	$3\frac{1}{4}$	77	9	2	$10\frac{9}{16}$
Dec. 6	27·80	1	$4\frac{5}{32}$	1	$4\frac{3}{32}$	$4·76\frac{7}{16}$	2	$3\frac{3}{4}$	77	9	3	$0\frac{1}{16}$
„ 20	$27·80\frac{1}{2}$	1	$4\frac{1}{8}$	1	$4\frac{3}{16}$	$4·76\frac{7}{16}$	2	$4\frac{3}{4}$	77	9	3	$0\frac{13}{16}$

* Fridays following.

Vol. LXXX.] [Part II.

JOURNAL

OF THE ROYAL STATISTICAL SOCIETY.

MARCH, 1917.

The Economic Resources of Russia, with Special Reference to British Opportunities.

By Baron A. Heyking, *Consul-General for Russia.*

[Read before the Royal Statistical Society, January 16, 1917, the President, Sir Bernard Mallet, K.C.B., in the Chair.]

I consider it a great honour to have been asked by your President to address you on the resources of Russia, with special reference to the opportunities for increased commercial and industrial intercourse between that country and the United Kingdom after the war. In so doing I hope to draw closer the bonds of friendship, which very happily unite the British and Russian nations at present. But I must ask for your indulgence as I am not a professional statistician, but only one whose profession it is to keep in close touch with statistics from a practical point of view.

The statistics I am about to lay before you have been compiled with the object of showing that Russia is a country of almost unlimited resources in all that is necessary to culture and civilization, and at the same time that there is an abundance of cheap labour waiting to be profitably employed in order that the agricultural products and mineral reserves of the soil may be utilized for the benefit of humanity.

Russian Statistics.—At the suggestion of your President I shall first try to give you some information about statistical work in Russia. It is centralized in the Central Statistical Committee of the Russian Home Ministry. This Committee was founded in 1863. It gathers its information from all the Ministries and other administrative organs and has edited a series of publications referring to different branches of economical and social matters and the organization of statistics. I beg to lay before you a list of those publications. In 1913, the Committee celebrated its fifty years' Jubilee, on which occasion it edited a detailed record of its activity in the past, and a volume of most instructive and interesting coloured charts and maps accompanied by letterpress in the Russian and French languages. I should like to have the pleasure and honour of presenting a copy of each of these publications to the Royal Statistical Society.

The Russian Central Statistical Committee publishes a Statistical Annual containing statistical information in regard to the extent of territory and population, medical assistance, epidemics, justice, prisons, urban aggregations, real property, agronomics, metallurgical industry, trade and commerce, ways of communication, finance and credit. I would be very pleased if the Royal Statistical Society would allow me to offer it a copy of the last issue of that Annual, edited in 1915. I have used this official publication as the chief source of my information, converting Russian poods into British tons and Russian dessiatinas into British acres, the pood being taken as equal to 36·11 lbs. and the dessiatina being taken as equal to 2·7 acres.

Russian statistical works are also published by the Russian Ministry of Finance, the Russian Ministry of Agriculture and Fisheries, the Mining Department and other Government Institutions.

Official statistics referring to the time of the war are, unfortunately, not yet obtainable, but I suppose that for the purpose of showing the economic resources of the Empire it is more important to refer to the years preceding the war than to the present time when the normal economic conditions of the country are out of gear. However, it must be borne in mind that after the war Russia's economic life will differ very considerably from what it was before. The war has brought about an awakening of the population all round and has accelerated her economic development. This awakening will have a still more marked effect when peace has been concluded. The entire energy of the nation will then be turned to the production of food-stuffs and raw materials as the chief source of wealth, and also to the industrial development of the country.

When the war is over, Russia will find herself financially in a position of great stress; the State debt increased by some twenty or thirty milliard roubles will demand the payment of an annual interest of several milliards of roubles. As far as the payments to be made abroad are concerned, the position will be intensified by the adverse rate of exchange. Hundreds of millions of roubles in pensions will have to be paid to all those maimed and wounded by the war, and the families of all those who have perished will have to be compensated in accordance with a Bill under the consideration of the Imperial Duma. The diminution of the annual revenue by approximately 800 millions, which the Government obtained from the sale of liquor, creates a deficit for which provision has already been made. The urgent need of the extension of railways, roads and waterways, and the spread of education—these necessary conditions of progress and production of wealth—will demand another huge outlay of capital. All this makes it of primary and vital importance for the Empire to increase its revenue by the development of those tremendous productive forces and natural resources of the country which hitherto have been so very much neglected.

Means of Communication.—As has already been mentioned, the rational exploitation of the economic potentialities of a country lies in the development of her means of communication. According to the Russian Statistical Annual, edited in 1915, the length of railways of general importance was in 1914 only 62,912 kilometres, viz.:—1·1 kilometre to every 100 square kilometres of territory and 4·1 kilometres to every 10,000 inhabitants of the Empire, while Great Britain can boast of 12·0 kilometres of railway to every 100 square kilometres of territory and 8·1 kilometres to every 10,000 inhabitants. The United States have more than five times the length of railways Russia has although their population is approximately only one-half of the number of the inhabitants of Russia and their territory represents only one-third of the Russian Empire.

No wonder then that under these conditions the great natural wealth of Russia has hardly been touched, that her industrial production is only beginning to tell its tale. Russia by the shock of the war has been awakened to the necessity of fully availing herself of her economic potentialities and of exploiting the great resources with which she has been endowed. To solve this great problem satisfactorily she not only relies upon her own strength, but also looks to her Ally, Great Britain, whom she believes is willing to assist and uphold her in her creative enterprise, organization and capitalization. Being one of her creditors, Great Britain is directly interested in helping Russia to increase her exports, organize them on a sound basis and develop her industries, which are quite able to provide Great Britain with all she requires from abroad.

Size and Population.—Russia is—I am using the words of that well-informed little Book of Russia, edited by the *Times*—a land of gigantic economic possibilities. Extending over half of the continent of Europe and a third of Asia, she comprises a continuous area of not less than 8,760,000 square miles. This area stretches over 163 geographical degrees from West to East and over 35 degrees from North to South. Russia is larger than the United States, Canada and India combined; she is more than twice the size of the whole continent of Europe. Her population of 186 million inhabitants is equal to that of the whole of the American continent (North and South) and Australia taken together, or that of the combined population of the United Kingdom, France, Japan and Italy. It exceeds the aggregate black and white population of Africa, also that of the United States and Germany taken together.

This great Empire is only surpassed in size and population by the British Empire, which comprises 13 million square miles with a population of over 440 millions of people. These stupendous figures will be even more enlarged by the conquest of the German Colonies, the declaration of the British Protectorate over Egypt, and the acquisition of Cyprus by Great Britain during the present war. Russia has, however, two great advantages over the British Empire in its geographical continuity and ethnographical homogeneity. The Empire presents one uninterrupted great stretch of land and its population—for the greater part—belongs to the white race.

The British and the Russian Empires, put together, account for approximately 40 per cent. of the world's population and 40 per cent. of the terra firma of the globe. This gives an idea of the political and economical weight of the co-ordination of the two greatest State organisms which have ever existed, a co-ordination which seems to be ordained by the natural conditions of their very existence; politically because their ideals and aims in assuring national independence to smaller friendly States are the same; from the point of view of world power because they are complements to each other, the one being the chief continental power, the other the chief naval power; economically because they can mutually provide each other with that of which they stand most in need, and which they can produce in greater abundance and in better quality than any other country.

Climate.—The climate of Russia is polar in the north, temperate in the middle zone and reaches sub-tropical heat in its southern regions. The agricultural products of the soil are, in consequence, of a most varied nature. In the forests are grown pine, fir, cedar, larch, birch, oak, maple, elm, beech. In the fields wheat, rye, oats, hemp, flax, barley, jute, beetroot, mangold, rape, cotton, maize, rice; in gardens and plantations tobacco, tea, grapes, all sorts of fruits—apples, pears, oranges, mandarines, tangerines, cherries, plums, figs, apricots, peaches—and vegetables of every imaginable kind, all in great abundance.

Timber.—The North of Russia is covered with the largest stretches of forest land in existence, of which much has not yet been properly surveyed, but which are rightly considered as inexhaustible, provided that transport facilities are forthcoming. The other chief sources for the supply of timber, the Canadian, American and Scandinavian forests, have been sorely depleted and cannot possibly increase their yield; it therefore appears that Russia is bound to become, to an even greater extent than at present, the chief provider of the world's market of this valuable material for the use of building, for navigation, wood pulp and many other purposes. While the supplies of wood from other countries are necessarily steadily diminishing, supplies from the almost limitless forests of European and Asiatic Russia are on the increase owing to the improved shipping facilities through the Kara Sea to the Yenisei, to the White Sea and Alexandrovsk on the Murman coast. The railway, connecting Petrograd with Alexandrovsk, and the projected railway lines to the mouth of the gigantic Rivers Yenisei and Obi will considerably increase the possibilities of the export of timber. It can be said, without exaggeration, that Russian resources of timber represent an untold wealth of the country, and that Great Britain, as well as other countries of the world, will, in the future, be obliged to draw on these resources. The timber trade in Russia stands next to the grain trade. The average annual exports during the years 1906–10 were from Riga 1,216,129 tons; from Libau 164,516 tons; from Archangel 633,709 tons; from Petrograd-Cronstadt 962,903 tons; Windau 262,903 tons. In the years preceding the outbreak of war, Great Britain received half her imports of wood from Russia, a proportion which will increase in favour of Russia in the future. It may therefore be assumed that in regard to timber, Russia occupies the position of a purveyor without the services of whom Great Britain could not exist for long.

Fur.—The same may be said of another article of export coming from the North of Russia, valuable furs which make the London market the centre of the fur trade of the world. According to the Russian Statistical Annual, edited in 1915, the number of wild animals and game killed in professional shooting for commercial purposes in 1913 and their total value comprises the following items and figures:

	Total number.	Total value in roubles.
Bear	1,444	17,724
Wolf	7,342	29,322
Common fox	20,156	128,073
Blue fox	21,228	232,254
Skunk	33,785	25,906
Siberian sable	17,007	21,824
Ermine	77,648	175,771
Marten	1,797	15,560
Sable	20	800
Squirrel	573,983	181,021
Hare	344,316	88,470
Musk	503	169
Reindeer....	288	1,488
Elk	1,537	20,627
Roe	4,000	16,139
Boar	545	1,917
Wild cat	2,169	1,444
Tiger	453	4,659
Total	1,108,221	964,168
Hazel hen	1,049,545	247,347
Woodcock	246 438	70,445
Grouse	22,633	10,973
White partridge....	188,792	29,714
Grey partridge	35,581	6,974
Bustard	1,294	1,005
Duck	131,817	27,787
Goose	14,380	9,559
Swan	1,072	1,376
Grebe	2,502	419
Total	1,694,054	405,599

These figures do not comprise the animals and game killed for sporting purposes. They must be very considerable, but are not shown in the official statistics.

Agriculture.—Russia is, notwithstanding her mineral wealth, primarily and chiefly an agricultural country. About three-fourths of her population are engaged in agricultural pursuits. The great plain, which stretches from the Western frontier of the Empire to the Pacific Ocean, only interrupted by the Ural and the Altai Mountains, is favoured with very fertile soil. In the central provinces, the famous black earth yields for several years consecutively an excellent harvest without the need of any artificial fertilization.

Russia is one of the world's principal producers of grain. According to estimates made by experts, she produces 51 per cent. of the rye, 25 per cent. of the oats, 33 per cent. of the barley and 22 per cent.

of the wheat grown on the surface of the globe. According to the Statistical Annual, published in 1915, the area under cultivation in 1914 comprised 133,658,843 dessiatinas (260,878,876 acres), of which were cultivated :

	Dessiatinas.	Acres.	Per cent. of the total area.
With grain (rye and wheat)	78,386,257	211,642,893	58·2
,, potatoes	3,536,130	9,547,551	2·7
,, oats	17,644,894	47,641,213	13·2
Of grazing meadows	34,645,032	93,541,586	25·9

The harvest in 1914 comprised :—

	Poods.	Tons.
Grain	3,680,026,100	59,355,000
Potatoes	1,621,300,300	26,150,000
Oats	808,764,900	13,045,000
Hay	2,973,149,500	47,945,000

This harvest showed an increase (+) or a decrease (—) on the average of the five years 1909–13 as to :—

		Poods.		
Grain (rye and wheat)	(—)	65,154,700	or	98·2 per cent. of that average.
Potatoes	(+)	103,263,900	,,	106·8 ,, ,, ,,
Oats	(—)	88,049,800	,,	91·2 ,, ,, ,,

An ever-increasing quantity of Russian food-stuffs is sent abroad. The following table shows the increase of those exports over a period of fifteen years from 1895 to 1910 :—

	1895.		1910.	
	In millions.		In millions.	
Exports of—	Roubles.	£	Roubles.	£
Cereals (rye, wheat, and oats)....	333	35·1	750	79·2
Forest products....	40	4·2	138	14·6
Eggs	20	2·1	64	6·7
Dairy produce	3	0·3	53	5·6
Miscellaneous, including beet sugar	209	22·1	245	25·9
	605	63·8	1,250	132·0

Of this amount, a comparatively small quantity reached Great Britain. During the period 1887–1910, the Russian exports of wheat to Great Britain fluctuated from 125,000 tons to 1,445,000 tons.

Russian grain went chiefly to Germany. That country received from Russia during the decade 1901–10, an average annual amount of 810,000 tons. It is to be hoped that the grain export of Russia to Great Britain will increase with the further development of an organized system of grain elevators, with the opening of the railway connecting Petrograd with the ice-free Murman port of Alexandrovsk and the hostile tariffs which Russia probably will have to meet in Germany.

In addition to the figures showing the enormous production of cereals and other food-stuffs in Russia, mention must also be made of cotton which, although an industry in its infancy, is developing rapidly, promising to make Russia independent of all imported cotton. The total production of raw cotton in the Empire comprised in 1914, 607,000 tons, exceeding that of 1913 by 143,000 tons and that of 1912 by 180,000 tons. In 1914, cotton was cultivated on 1,068,828 acres. The yield in the best districts is 450 lbs. per dessiatina. Russia's cotton industry comprises 10,000,000 spindles, her 360 cotton mills with 215,000 power looms consume 2,000,000 bales of 500 lbs. each. It is worthy of note that 90 per cent. of the machinery used in Russian cotton mills is of British make.

Russian agriculture is also connected with cattle breeding on a gigantic scale. Before the war, the live stock in Russia comprised approximately 70,000,000 sheep, 50,000,000 cattle, 31,000,000 horses and 13,000,000 pigs. A very considerable trade is done in poultry, eggs and game.

The vast distances of the Empire, the difference of climate in its various parts and the great accumulation of goods at the special periods of the year when these are ready for sale and exportation, make the question of cold storage a subject of outstanding importance. British engineers have played an important part in establishing refrigerating apparatuses, but more could be done by them in future to supply Russia with adequate means of assuring perishable goods a safe delivery to customers abroad.

Bacon.—In close connection with agriculture stand the bacon, tobacco, fruit, wine, tea, fish, paper and beet sugar industries. The bacon trade is chiefly due to English enterprise and capital, and here we have a good example of how English requirements can benefit Russian production and develop its possibilities. The experiment of supplying the Russian peasant with the best quality of pigs for bacon has enabled even poorer peasants to take up the occupation of fattening pigs. Hitherto, only the wealthy peasant was able to do this as the heavy-weight pigs for sale in Russia had to be fed up during fifteen to eighteen months. The bacon factories have created a new demand for light pigs, which are ready in from five to six months. The advantage for the pork breeder is such that the output of pigs can easily be increased two or three times with the same capital. There are at present eight bacon factories: two in Siberia, one in Poland, one in the Baltic Provinces and four in the Central Provinces, but as soon as the war is over and its economic effects have been overcome, this trade is bound to increase as—once properly organized—it must be of great economic value and promises to be a very lucrative business in a country like Russia which can supply an unlimited number of pigs.

Tobacco.—The cultivation and manufacture of tobacco is another very promising economic feature of Russia, which is already in a flourishing condition. According to the Statistical Annual of Russia, the total area under cultivation of tobacco in Russia comprised in 1913, 295,409 tobacco plantations, covering an area of 154,327 acres. Russia, therefore, already occupies the second place among the tobacco-growing countries. In 1913, the area under tobacco was, in the United States 1,209,600 acres; in Hungary 110,700 acres; in Japan 75,600 acres; in Germany 35,100 acres, and in Rumania 27,000 acres.

Not less than 84·80 per cent. of the tobacco plantations are to be found in European Russia proper, while the rest are situated in the Asiatic parts of the Empire. The following figures show the number of plantations and the area under tobacco in the different parts of the Empire in 1914:—

	Number of plantations.	Area under cultivation.	
		Dessiatinas.	Acres.
European Russia proper	250,394	35,406·85	95,598
Vistula Provinces	6	Not mentioned.	—
The Caucasus	23,747	20,916·6	56,464
Siberia and the Steppe Region	21,253	760	2,052
Turkestan	9	75	202

In the northern parts the tobacco is of the common sort known as mahorka, while in the Crimea and the Caucasus the finer brands grown at Sukhum, Trapezund, Sotchi and Kutais are cultivated. Immense areas extending from Novorossisk to the Turkish frontier along the Black Sea shores known to be suitable for tobacco growing are not yet cultivated. But as the demand for the finer brands of Russian tobacco is growing in Russia as well as abroad, a very considerable development of the Russian tobacco industry is only a matter of time. Undoubtedly any enterprise in that direction has the most brilliant prospects.

Sugar.—The beet sugar industry in Russia—one of great importance—is steadily growing and is bound to increase considerably in the near future. Only lack of capital and proper organization has prevented Russia from becoming the first among the nations engaged in the sugar industry. Climatic conditions and the quality of the soil would favour much larger crops of beetroot than those obtained hitherto. Assistance for the introduction of better methods in this culture is required. A vast field awaits the enterprise and energies of the British in the introduction of modern methods in the beet sugar cultivation into Russia. The following table taken from the Statistical Annual of Russia, edited in 1915, shows the expansion in the cultivation of beet sugar, 85 per cent. of which is obtained in the centre of European Russia and 15 per cent. in the Vistula provinces :—

Years.	Area of cultivation.		Quantity of beetroot harvested and used in the fabrication of sugar.	
	Dessiatinas.	Acres.	Poods.	Tons.
1912–13	684.266	1,847,518	639,002,130	10.306,486
1911–12	712,501	1.923,752	817,123,700	13.179,414
1910–11	604,212	1,631,372	799,567,210	12,734,955
1909–10	499,360	1,348,272	423,839,000	6,836,113
1908–09	498,528	1,346,025	497,805,210	8,029,116

The progress in sugar production in Russia is revealed by the fact that in—

1885–86 .... 38,980,000 poods (628,800 tons) were produced in Russia.
1892–93 .... 64,180,000 „ (1,025,200 „) „ „
1910–11 .... 117,190,000 „ (1,896,200 „) „ „

In the past Russia had to meet the competition of Germany and Austria in the sugar market and her exportation of sugar was limited on the strength of the Sugar Convention of Brussels. The war has altered her position and will make it possible for her to export sugar on a much larger scale, supplanting German and Austrian sugar on the British market. Before the war her sugar import into the United Kingdom was far behind that of Germany and Austria, as is shown by the following figures for the year 1913 :—

British imports of refined beet sugar.

From Germany	465,453 tons.
From Austria	198,063 „
From Russia	2,939 „

Fruit.—Fruit-growing is another flourishing industry which is not sufficiently known abroad chiefly owing to the fact that the exportation of fruit from Russia has hitherto only been carried out in a purely spasmodic way quite unsuitable to the market. Here again our friends the British could be of assistance in helping us to organize this promising industry. In the Crimea, fruit-growing is a lucrative business. Fruit preserving factories are expanding. Little Russia, Cis-Caucasia, the Black Sea and the Caspian region, Bessarabia, Podolia, Simbirsk and Saratov are also rich in the production of apples, pears, nuts and other fruits. Ferghana, Bokhara and Khiva abound with almonds, pistachios, pomegranates, oranges and other southern fruit. The different products manufactured from fruit, for instance the fruit jellies, jams and preserved fruit of Kieff, deserve special mention for their excellence and would find ready sale in Great Britain if they were only brought to the market in a manner more attractive to the eye.

Wines.—Russian wines, which are almost unknown in Great Britain, will certainly be largely exported in the future. The Crimea and Bessarabia produce light table wines, Turkestan and the Caucasus —heavier table wines and champagne. They are of very good quality, but up to the present not sufficiently matured, and their price is moderate in comparison with that of French wines.

Tea.—Tea is grown in plantations near Batoum and has proved to be of good medium quality. As there is a great area suitable for tea-growing along the shores of the Black Sea, it is probable that in the future Russia will only import the finer brands from China, India and Ceylon and satisfy her requirements, to a great extent, by home-grown tea.

Fisheries.—A source of great wealth lies in Russia's fisheries. There does not exist a complete valuation of the total yearly output of the fisheries, but it is not improbable that their value exceeds those of any other countries. The fisheries are divided into geographical zones. According to the Russian Statistical Annual, edited in 1915, the output, value and number of persons engaged in this industry in the year 1911 are represented by the following figures :—

Zones.	Output of fisheries in poods. (000's omitted.)	Output of fisheries in tons.	Value in roubles. (000's omitted.)	Number of persons engaged in fishing.
The Caspian region	23,167,	373,700	66,367,	172,000
The Upper Volga	2,916,	47,000	2,280,	10,000
The Azov and Black Seas	4,182,	67,500	6,262,	35,000
The Baltic	2,697,	43,500	5,394,	21,000
The North West Lakes	1,809,	29,100	2,928,	11,000
The Murman and White Sea Coasts	900,	14,500	2,000,	14,000
Total in European Russia....	35,671,	575,300	85,231,	263,000
The region of the River Obi	753,	12,100	2,379,	4,300
The region of the River Yenisei	162,	2,600	486,	900
The region of Lake Baikal	280,	4,500	788	2,500
,, ,, ,, Yakuts	57,	900	71,	500
,, ,, Far East	4,500,	72,600	4,200,	8,000
,, ,, Turkestan	2,500,	40,300	4,000,	17,000
Total in Asiatic Russia	8,252,	133,000	11,924,	33,200
Grand total	43,923,	708,300	97,155,	296,200

According to this table the Volga-Caspian fisheries stand first. A large amount of this catch and especially the more valuable kind of caviare are exported abroad. In Astrakhan immense refrigerating plant and storage accommodation serve this purpose. The richest sturgeon river is the Kura. It yields annually not less than 320 tons of caviare. Besides the sturgeon, the Caspian region contains carp, silurus, bream, barbel, salmon and other species.

The Caucasian region is famous for its herring fisheries, the Black Sea for its beluga. The Baltic Sea fisheries are chiefly engaged in the catch of sprats, pilchards, cod, eels, smelts, flounders, salmon and sig. Riga and Reval are the chief centres of the canning industry. The fisheries of the lakes of the North West are also of great importance, although they require organization.

The Northern region of the Murman and White Sea districts is chiefly engaged in open sea fishing for cod, haddock, flat fish, wolf-fish, salmon, navaga, herring and seal.

The Far Eastern fishing industry is engaged chiefly in the catch of salmon, the bright red nerka and herring. In 1910, over forty million of herrings were caught in this region. The estuary of the Amur is especially famous for its quantities of salmon. The fisheries in these regions will attain much greater dimensions when properly organized.

The Turkestan fishing industry comprising the basin of the Aral Sea is chiefly engaged in the catch of the silurus, bream, vobla, sandre, carp, barbel, pike and sturgeon.

Fish farming, which was started in the Polish and Baltic provinces, has a great future in Russia owing to the natural conditions prevailing in the Empire, which are favourable to such farms.

Paper.—The manufacture of paper in Russia is favoured by the unequalled wealth of timber grown on Russian soil. Yet Russia is poor in supplies of wood pulp, a material which is indispensable for the requirements of paper mills. This rather surprising fact can only be explained by lack of organization. Russia's manufacture of paper has remained far behind the ever-increasing demands of the market, with the result that the price of paper has, in a comparatively short time, risen to nearly 400 per cent. and that great quantities of paper had to be imported from Finland and abroad. This state of affairs is quite abnormal. It is a sign of lamentable inefficiency, as natural conditions have provided Russia with the means to satisfy her own demands and also the requirements of buyers from abroad. It is to be hoped that, owing to powerful stimulus from Russia or friendly foreign quarters, this industry will be provided with a more thorough organization.

Minerals.—The mineral resources of Russia, lying in her soil, have hardly been touched and await the help of our friends and allies for their development in the near future. According to the Statistical Annual, edited in 1915, the output of minerals in the Empire in poods (one pood is equal to 36·11 English pounds) for 1912 and 1911 is as follows :—

	1912.		1911.	
	Poods.	Tons.	Poods.	Tons.
Gold	3,569	57	3,584	57
Platinum	337·3	5	352·5	5
Silver	1,100	17	947	15
Lead	103,740	1,673	75,585	1,219
	(000's omitted.)	(000's omitted.)	(000's omitted.)	(000's omitted.)
Zinc	715,	12,	746,	12,
Copper	2,047,	33,	1,594,	26,
Pig iron	256,266,	4,133,	219,363,	3,538,
Iron and steel	227,541,	3,670,	202,707,	3,269,
Manganese ore	50,192,	810,	43,123,	695,
Coal	1,887,000,	30,435,	1,784,690,	27,979,
Naphtha	565,300,	8,634,	558,749,	9,012,
Salt	116,364,	1,877,	122,940,	1,983,

According to their places of origin, the output of these minerals in 1912 was as follows :—

	The Urals.		The North and North-West.		The Western mineral region.	
	In poods.	Percentage of the total output.	In poods.	Percentage of the total output.	In poods.	Percentage of the total output.
Gold	670	18·8	—	—	—	—
Platinum	337·3	100·0	—	—	—	—
Silver	400	36·4	—	—	—	—
Lead	6,010	5·8	—	—	900	0·9
Zinc	—	—	—	—	534,600	74·8
Copper	1,082,000	54·9	—	—	—	—
Pig iron	50,600,000	19·7	66,000	0·0	23,900,000	9·3
Iron and steel	39,400,000	17·3	15,441,000	6·8	24,600,000	10·8
Manganese ore	150,000	0·3	—	—	—	—
Coal	60,000,000	3·4	—	—	394,500,000	22·3
Naphtha	—	—	—	—	—	—
Salt	25,838,000	22·2	137,000	1·2	263,000	0·2

	Moscow and Volga region.		The South and South-East.		The Caucasus.	
	In poods.	Percentage of the total output.	In poods.	Percentage of the total output.	In poods.	Percentage of the total output.
Gold	—	—	—	—	—	—
Platinum	—	—	—	—	—	—
Silver	—	—	—	—	267	24·3
Lead	—	—	—	—	95,430	92·0
Zinc	—	—	—	—	180,200	25·2
Copper....	—	—	—	—	595,000	30·2
Pig iron	8,300,000	3·3	173,400,000	67·7	—	—
Iron and steel	20,100,000	8·9	128,000,000	56·2	—	—
Manganese ore	—	—	14,742,000	29·2	35,300,000	70·5
Coal	12,900,000	0·7	1,299,400,000	67·3	4,300,000	0·2
Naphtha	—	—	1,000,000	0·2	548,300,000	97·0
Salt	—	—	84,340,000	72·5	78,000	0·1

	Trans-Caspia.		Turkestan.		Western Siberia.	
	In poods.	Percentage of the total output.	In poods.	Percentage of the total output.	In poods.	Percentage of the total output.
Gold	—	—	—	—	365	10·2
Platinum	—	—	—	—	—	—
Silver	—	—	—	—	433	39·3
Lead	—	—	—	—	1,400	1·3
Zinc	—	—	—	—	—	—
Copper	—	—	—	—	294,000	14·9
Pig iron	—	—	—	—	—	—
Iron and steel	—	—	—	—	—	—
Manganese ore	—	—	—	—	—	—
Coal	—	—	6,000,000	0·3	43,200,000	2·3
Naphtha	12,000,000	2·1	4,000,000	0·7	—	—
Salt	3,100,000	2·7	545,000	0·5	1,463,000	1·3

	Eastern Siberia.		All Russia except Finland.
	In poods.	Percentage of the total output.	
Gold	2,534	71·0	3,569
Platinum	—	—	337·3
Silver	—	—	1,100
Lead	—	—	103,740
Zinc	—	—	714,800
Copper	1,000	0·0	1,972,000
Pig iron	—	—	256,266,000
Iron and steel	—	—	227,541,000
Manganese ore	—	—	50,192,000
Coal	66,700,000	3·5	1,887,000,000
Naphtha	—	—	565,300,000
Salt	600,000	0·5	116,364,000

It appears from this table that the Ural Mountains are the chief centre for the supply of minerals, with the exception of salt, of which 72·5 per cent. is produced in the south and south-east of Russia; zinc, of which 74·8 per cent. comes from the western mineral region; pig iron and iron and steel, of which 67·7 per cent. and 56·2 per cent. respectively is derived from the south and south-east of Russia; and naphtha, of which 97·0 per cent. is found in the Caucasus. But these figures, of course, cannot give an idea of the potentialities of the hitherto undeveloped mineral resources of Russia.

Coal.—Coal is present in the soil of many parts of the country in great quantity. The richest coalfield of European Russia is situated in the Donetz basin, which supplies 55 per cent. of coal and 80 per cent. of the coke consumed in the Empire. Besides, coal deposits are found in Dombrova in Poland, in the Ural and the Moscow basin. Siberia possesses enormous coalfields. The Kutznetsk basin surpasses the Donetz deposits, the Ekibastus coalfield on the Irtysh River extends over twenty-five square miles. In Western Siberia, the Sudzhensky district, the Tcheremkova field near Irkutsk, the Karraginsky mine, which belongs to the Spassky Copper Company, and the Minusinsk region in the eastern part of the Altai, contain rich and practically inexhaustible deposits of coal, which can be mined without great difficulty and at comparatively small expense. Their exploitation has been hitherto handicapped by the insufficiency of transport facilities and the lack of industrial development of the country. There is no doubt that with the establishment of proper communication and the investment of sufficient capital, a brilliant future awaits these coalfields.

In Eastern Siberia and the Pri-Amur region, the southern reaches of the Ussuri River and the Island of Sakhalin must be specially mentioned. The coal of Sakhalin is of excellent quality and has the reputation of being equal to the coal found in the Cardiff collieries. The region watered by the Selinga and Burea Rivers, tributaries of the Amur, is known to contain coalfields of great magnitude. The coal mines of the Caucasus, of Turkestan and of the Tkvartschelsk district on the shores of the Black Sea are full of promise, although they are only partially worked at present.

This stupendous wealth of coal supplies Russian industry with possibilities which will assure to skilled labour, capital and railway extension, an unprecedented reward and prosperity.

Mineral Oil.—The resources of mineral oil in Russia are as considerable as those of coal. The Baku oilfields extend over an area of 2,700 acres according to the estimates of geologists. Quite recently in the Apsheron Peninsula the Surakhany and Binagody grounds have considerably increased their output of oil. The oil deposits at Grosny are also very rich. There is oil at Tcheleken, an island near the eastern shore of the Caspian Sea, near the River Emba in the Urals, in the somewhat over-rated oilfields of Maikop, in the Ferghana region of Turkestan, in Trans-Caspia and the Island of Sakhalin.

The right of exploitation of oil-bearing lands is sold by auction by the State to the highest bidder. The royalty to be paid to the State has gradually increased and has, in some cases, reached 50 per cent. of the total oil extracted; consequently the price of oil has considerably increased. In order to counteract the rise of the market price of oil, the Government restricted the auctions of oil-bearing plots in the Baku region. According to private statistical information, the restriction of the auctions caused a decline in the output of oil in 1913. The naphtha industry in Russia, which in 1901 provided 50 per cent. of the total output of the world's mineral oil, at present has also to contend against the competition of the enormously increased production of oil in North America. However, Russia possesses so many hitherto untouched oilfields, that there is no fear of any serious setback provided sufficient capital and labour be applied. There is no doubt that after the restoration of peace, the naphtha industry in Russia will acquire much greater dimensions than it has hitherto attained.

Gold.—Gold is found throughout Siberia in the south as well as in the northern region, the taiga—but this industry is still in its infancy; areas which are known to be gold-bearing, the Amur region for example, have not yet been prospected. During the last years the industry has remained stationary owing to lack of capital, lack of transport facilities and the prohibition of the Russian Government to employ Chinese and Korean labour. At present British capital invested in gold mines does not surpass 6,200,000*l.*, viz., 2·8 per cent. of the total amount of British capital invested in gold-mining. A series of railway lines to open up the Southern Ural Mountains and Western Siberia are under construction, the Altai railway being already completed. The main centres of gold-mining are situated along the Lena River in the neighbourhood of the principal tributaries of the Amur in the Amgun River system, the Southern Ussuri region, on the shores of the Tartar Straits and in the Southern Altai. Gold is chiefly found in alluvial deposits on application of dredgers and excavators. The Minusinsk and Achinsk districts contain also gold quartz mines in which the gold is obtained from ores.

Platinum.—The platinum industry may be considered as a monopoly of Russia since not less than 95 per cent. of the world's output of that rare and valuable metal is found in the Russian Empire. The richest deposits are situated on the Iss River at the Demidov or Tagil estate and also at the Nicolay Pavdinsk, Polyakov and Syssert estates. Nearly all the platinum found is alluvial.

Iron and Steel.—Another promising factor in the industrial energy of Russia is her iron and steel industry, which is in some places already fully established and provided with modern plant, but which in future is bound to increase to much greater dimensions. At present the chief centres of this industry are found in the Krivoy Rog basin along the River Guletz and its tributaries in the Ekaterinoslav and Kherson provinces. Its ores have 50 per cent. to 70 per cent. of pure metal and the reserves of that ore are estimated at 200,000,000 tons. The adjoining Korsak Mogila deposits of iron in the Tauris provinces are likewise of great importance. It is interesting to note that an enterprising Englishman, Mr. John Hughes, was the pioneer of this industry which at present produces annually something like 3,000,000 tons of iron. Big seams of 5 to 12 yards of brown ores which contain 35 per cent. of iron are found on the Sea of Azov; its reserves are estimated at 300,000 tons. The Kertch fields contain about 500,000,000 tons of extremely rich iron; owing to their proximity to the sea, these fields enjoy special advantages for export. Extensive deposits of magnetic iron ore occur in the central part of the Ural Mountains with big deposits of brown ore on the eastern slope. In Poland ironworks have been active since the beginning of the nineteenth century and have steadily developed. The main source of pig iron is situated in the south of Russia.

The great expanse of Siberia is provided with iron ores in enormous quantities. The deposits of Abakan, Nikolaievsky Zavod and Petrovsky Zavod are foremost. The Abakan deposits situated near Minusinsk on the surrounding land watered by the Yenisei yield 66 per cent. of magnetic ores. The Minusinsk railway, now under construction, will greatly facilitate the transport of this ore. The deposits of the Nikolaievsky Zavod are situated on the Angara River, which flows from the Baikal Lake and are about eighty miles distant from the important town of Irkutsk. They contain 50 per cent. to 75 per cent. of magnetite, hematite and limonite ores covering an area of several hundred square miles. In the smelting works English machinery is used. The Petrovsky Zavod lies near the city of Chita. Here the ore contains 54 per cent. of iron. Both the Nikolaievsky and the Petrovsky deposits are only worked on a small scale chiefly owing to market conditions. More efficient organization, a greater supply of capital and the progress of industrial development in this part of Siberia are bound to result in considerable extension of these works. The rich iron veins of the Pri-Amur region and numerous iron deposits in out-of-the-way portions of Siberia have hardly been tapped. They await the introduction of transport facilities and the investment of capital.

Copper.—Copper mining is a comparatively old industry in Russia which was started in the eighteenth century. Till 1911, the works of Demidov and the Bogoslovsky Works in the Ural were the most important centres of copper production in Russia. In 1911-12, the Kyshtim Works improved their plant and gradually took precedence. According to the last report published by the corporation, the mines and plants of this flourishing concern are now working under conditions which enable it to produce 10,000 tons of copper a year. Besides the Kyshtim corporation, which is an Anglo-Russian company, many other British companies were formed for the extraction of copper, as for instance, the Syssert, Tanalyk, Irtish and Russo-Asiatic. New copper works will soon be started in the Ural—a sign that this industry is rapidly attaining bigger proportions. In the Caucasus the copper mines are exceptionally rich : the Zangezursky district in Trans-Caucasia is noted for its wealth of this mineral. Unfortunately, its development is hampered by the lack of transport facilities. The Spassky Copper Company in Western Siberia is owned by a company of British capitalists ; its importance will be considerably increased when the projected Western Siberian railway has been completed. Copper is also found in the Kirghiz Steppes. If all the land known to contain copper were to be worked, there seems no end to what might be achieved. The Kirghiz Steppes, the region of the Yenisei, the Altai and the Semipalatinsk districts have been geologically surveyed for copper and found to contain very large tracts of land with abundance of rich copper ore. A brilliant future awaits those whose enterprise is turned in this direction.

Salt.—All this points to the fact that to a very considerable extent, the mineral wealth of Russia is merely surface scratched, and is very far from being fully developed. For instance, mineral salt can be found in Russia in quantities sufficient to supply the wants of the whole world for centuries ; yet these resources of rock salt contained in the Ural Mountains, the Caucasus and the Gouriev and Emba districts have hardly been touched. The lake salt production, the principal centres of which are in the Perm and Astrakhan provinces, the Bakhmut and Slaviansk districts and the lakes of Baskunchak and the Crimea, is also very much neglected, with the result that the quantity produced in Russia is unable to supply the Empire's total consumption of salt. The Amur district, which, owing to its large fish industry, is a big consumer of salt, imports from Japan, China and Germany about 500,000 tons annually, an economical abnormity entirely due to the lack of transport facilities which in future will have to be remedied by the lowering of the railway tariffs for the transportation of salt to the Far East of Siberia.

Mica, Asbestos, Tungsten, Osmium, Iridium, Talc, Phosphates, Graphite, Mercury, Lead, Zinc, Silver, Quicksilver, Aluminium, Nickel, Cobalt, Antimony, Bismuth.—Russia is rich in deposits of mica, asbestos, tungsten, osmium, iridium, talc, phosphates, graphite, mercury, lead and zinc, silver, quicksilver, aluminium, nickel, cobalt, antimony, bismuth. But only a limited quantity of all this mineral wealth is available for the market, so that Russia is still obliged, to a considerable extent, to rely on the import of these commodities from abroad, in spite of the fact that not only could she be independent of all foreign supply, but she could provide the whole world with a share of her enormous mineral wealth. Here, undoubtedly, lie industrial and commercial opportunities which I hope will be appreciated in Great Britain.

The present position of the home production of minerals in Russia, their exportation, importation, and the percentage of their consumption provided for by the home production in the years 1911 and 1912, is shown in the following table taken from the Russian Statistical Annual, edited in 1915:—

Importation, exportation and consumption of the products of the mining industry in 1911 *and* 1912 *in tons.*

	1911.				
Mineral products.	Production in Russia.	Importation from abroad.	Exportation from Russia.	Consumption in Russia.	Percentage of consumption provided for by home production.
Lead	1,220	43,000	—	44,000	2·8
Zinc	12,000	20,000	—	34,000	38·0
Copper	26,000	8,000	—	34,000	73·8
Pig iron	3,534,000	55,000	1,000	3,589,000	97·9
Iron	2,843,000	27,000	20,000	2,816,000	100·9
Steel		18,000	52,000		
Coal	28,060,000	5,128,000	94,000	33,012,000	84·7
Salt	1,983,000	12,000	2,000	1,993,000	99·5
Naphtha	9,012,000	16	—	9,012,000	100·0
Manganese ore	696,000	—	565,000	131,000	—

	1912.				
Mineral products.	Production in Russia.	Importation from abroad.	Exportation from Russia.	Consumption in Russia.	Percentage of consumption provided for by home production.
Lead	2,000	44,000	—	46,000	3·7
Zinc	12,000	19,000	—	30,000	38·0
Copper	33,000	4,000	—	37,000	81·4
Pig iron	4,133,000	107,000	74	4,240,000	97·5
Iron	3,670,000	47,000	20,000	3,697,000	99·3
Steel					
Coal	30,435,000	4,940,000	161,000	35,215,000	85·8
Salt	1,877,000	73,000	9,000	2,941,000	95·8
Naphtha	9,118,000	50	500	9,117,000	100·0
Manganese ore	710,000	—	955,000	200,000	—

These figures show that Russia was able to supply the total of her own requirements only in regard to naphtha, while being in a position to provide the foreign markets with naphtha to a small extent and manganese ore—the whole production of this latter mineral is exported abroad. In 1912, Russia had to import from abroad 96·3 per cent. of the lead she consumed, 62 per cent. of zinc, 18·6 per cent. of copper, 14·2 per cent. of coal and 4·2 per cent. of salt. The amount of the production, importation and exportation of other metals is not given in Russian official statistics.

This state of affairs is economically unsound as the present output of the mining industry in Russia falls lamentably short of the vast possibilities represented by the enormous wealth of the Empire. But there can be no doubt whatever as to the brilliant future that awaits this branch of Russian industry.

On the strength of the above it appears therefore that judging from the unbounded natural economic resources Russia may become the chief supplier of food-stuffs and raw material of the world if only she reverts from her primitive means of production to more scientific methods and if in general better organization is applied and the means of communication and transport are improved and augmented.

At present Russia's export is chiefly of an agricultural character. The average value of exports from Russia for the five years, from 1909 to 1913, shows that out of a total yearly average value of exports of 142,280,000*l*., not less than 90,590,000*l*., or over 63 per cent., is accounted for by food-stuffs and live stock, 49,000,000*l*. represents the value of crude and semi-manufactured goods and only 2,690,000*l*. manufactured articles. Russia should aim not only at increasing her exports in general, but also that of the high-priced manufactured or semi-manufactured articles in particular. That cannot be done otherwise than by improving technical knowledge, skill and practical experience and further investment of capital in industrial concerns. Here is an opportunity for British enterprise and money. The Russian Government has already recognized the educating influence and the advantages to be derived by Russia from friendly capital and engineers assisting the economic development of the country.

The development and proper organization of the productive forces of the country will not only increase the exports from Russia, but also prevent the importation of articles which the country can easily produce herself. In 1913, Russia imported :—

Article.	Value in £.	
	£	£
Plants and seeds	2,913,500	
Fresh fruit, lemons, nuts and plums	2,477,900	
Fish and oysters	3,820,200	
Tallow, animal fats, and beeswax	2,025,300	
Prepared leather and manufactures of leather	2,789,600	
Carpentry and fretwork	667,900	
Boot blacking	600,000	
Vegetable oils	575,600	
Resin and pitch	494,700	
Wood pulp and cellulose	219,600	
Higher class paper	1,100,000	
Toys	992,400	
Raw and manufactured silk	4,247,000	
Thread and yarn	3,006,900	
Woollen goods	4,582,100	
Lace	765,500	
Wines	2,058,800	
Furs and pelts	1,632,400	
Paraffinum and vaseline	239,500	
Live stock	1,761,500	
Bark tanning for tanning	771,900	
Flax, hemp and articles thereof	708,400	
		37,910,700
Bar iron, steel implements, tools, nails, constructional material, drain pipes, glass physical apparatus, hardware, &c.	15,279,400	
Chemical goods, pharmaceutical goods, spices	4,749,700	
Coal and coke	8,777,000	
Machinery	12,944,700	
Agricultural machinery	3,984,500	
Raw cotton	11,404,100	
Other goods	28,999,900	
		86,139,300
		124,050,000

For a country with the economic resources of Russia it is evidently economically unsound to import flax, yarn, furs, live stock, plants, leather, tallow, beeswax, fruit, fish and so forth. Russia has the possibility to suppress all these imports and to turn the trade balance by saving yearly the greater part of the huge amount of 124,050,000*l.* which represents the value of these imports.

British opportunities in the economic resources of Russia must show themselves also in the development of the trade relations between the two Empires. Up to the outbreak of the war British trade with Russia has been continually declining to the advantage of the Germans, as is shown by the following official returns of exports and imports of Russia in millions of roubles :—

	In 1909.	In 1910.	In 1911.	In 1912.	In 1913.	Increase or decrease in 1913.
Exports of Russia to—						
Germany....	387·0	390·5	490·5	453·8	452·6	− 1·2
Great Britain	288·7	315·0	336·6	327·5	266·9	− 60·6
Imports of Russia from—						
Germany	354·8	441·0	476·8	521·1	642·8	+121·7
Great Britain	128·0	153·5	153·9	139·3	170·4	+ 31·1

These figures reveal a very unsatisfactory state of affairs for British commercial interests. The means to remedy it to the advantage of Great Britain have been nowadays sufficiently elucidated to make special mention of them here unnecessary. There is no doubt that Great Britain could easily replace the imports from Germany into Russia by her products. The following table of the principal imports from Germany, Austria-Hungary and the United Kingdom into Russia in 1913 will bear that out :—

	From Germany and Austria-Hungary.	From the United Kingdom.
	£	£
Agricultural machinery	1,254,000	1,103,000
Aluminium and aluminium wares	1,102,000	—
Boots and shoes	108,655	800
Brass and brass wares	762,100	18,200
Cables, cordage, twine and nets	134,960	43,900
Cast-iron goods (stoves, baths, &c.)	166,700	—
Clocks and watches	113,145	—
Clothing (female)	104,150	6,300
Colours, paints, varnish	168,650	61,000
Copper goods	165,040	8,000
Cotton prints	64,000	8,500
,, stockings and socks	145,900	—
,, velvets and plushes	95,590	—
Electrical appliances....	280,300	6,500
,, dynamos and machinery	233,400	59,900
Enamelled hollow-ware	122,200	4,600
Fertilizers	632,870	59,100
Fireproof bricks, retorts, &c.	198,810	—
Furniture	119,050	2,000
Hollow glassware (bottles, &c.)	74,600	900
Gloves	145,260	—
Implements and tools	1,175,450	252,800
Internal combustion engines	654,000	—
Jewellery and trinkets	183,650	200
Knives	147,400	2,000
Lamps	513,500	200
Road traction engines and rollers	378,900	187,000
Printing machinery	157,320	—

	From Germany and Austria-Hungary.	From the United Kingdom.
	£	£
Milling machinery	212,115	—
Medicines	495,560	22,200
Motor-cars and parts	789,200	127,700
Musical instruments	434,450	4,270
Photographic goods	245,720	—
Pins and needles	83,370	—
Rubber tyres	60,850	2,100
Scientific instruments	442,380	99,000
Silk manufactures	254,500	11,500
Machine tools....	604,200	85,000
Toys and games	122,200	10,600
Metal tubes, pipes, &c.	186,900	30,000
Umbrellas and parts	29,950	300
Wooden goods	194,750	4,500

Russia is willing to give preference to British goods provided they are offered at the same price and under the same conditions as German goods. Here is therefore a great opportunity for British merchants.

Gentlemen, let me close this paper with a few general remarks about the present great revival of Anglo-Russian intercourse. What is the meaning and significance of this desire to draw the bonds of friendship between the British and Russian nations closer together? Is it a fashionable craze, a mere bubble on the surface of the life of the nation, a passing whim and wish, or the result of the frenzy to win the war by mutual support against the common enemy? No, this splendid movement has much deeper roots, and is based on a much firmer foundation. It is founded alike on the dictates of reason and intelligence, as well as on the demands of the heart. It is also the result of a "perelom," a fundamental change in the character of this nation, which has perhaps no parallel in its history. A new and better order of things arises in such stock-taking times of great trial, when nations by the force of events part with pre-conceived ideas, erroneous conceptions of the past, and exploded bugbears of old. This refers especially to the impracticable idea of splendid isolation; the false conception of the unsympathetic foreigner as a whole, without making due allowances for the difference between friend and foe; and the ungrounded fear of Russia as the rival and enemy who endangers the safety of the British Empire.

We see nowadays Britannia horrified at the lawlessness of an unprecedented and uncivilized warfare, emerging from her previous proud and somewhat short-sighted insularity, trying to pierce the mists of her old prejudices against the foreigner in general, and the Russian in particular, with a more just and right appreciation of the sympathy and assistance she can rightly expect from her friends and Allies.

It is only thirty-eight years ago—a short moment in the life of a nation—since Great Britain stopped the victorious armies of Russia standing at the gates of Constantinople, laying it down as a rule that Tsargrad must not be Russian. And now, what a contrast! Great Britain, conjointly with France, officially recognizes the claims of Russia to Constantinople, which is the entrance-key to Russia and at the same time her real religious metropolis. For these two reasons, the one geographical, the other religious, Constantinople, which has been estranged from Christendom for centuries through the Turkish yoke, must come under the rule of Russia.

The gratifying change in the British attitude towards Russia, in the question of the dominion of Constantinople, is simply the result of this change from rivalry and mistrust of the past to the trust and goodwill which is at present extended to the Russian friend, who must not be hindered in her doings, but rather encouraged.

The same change for the better has taken place in the domain of Anglo-Russian trade relations. Here Great Britain was made alive to her opportunities in Russia by the extraordinary success of German trade in that country. The view British merchants generally took of Russia, from a commercial point of view, was that the language difficulty, the obstacles in the way of transport in the vast dominions of the Tsar, the long credit system there, the unpalatable experiences with faulty debtors, and the slow methods of justice, made it on the whole not worth while to waste energy and money in a country, where the inconveniences and risks seemed so great as to be insufficiently compensated by adequate gains. That is not the way in which British business people look upon Russian affairs at present. The enormous gains the Germans have been able to show for themselves, in their trade with Russia, have proved to Englishmen that the supposed difficulties in trading with Russia can be overcome with proper organization, forethought, and energy, and that it pays well to do this.

A new and more correct idea of Russia has also arisen as a result of the study of that country's art, literature and science. English people engaging in those studies discovered that Russian art, literature and science could no longer be overlooked as being of small importance. The passionate love which manifests itself in this country for all the revelations of the Russian character in art, learning and practical life, is the outcome of the tacit or open recognition by Englishmen that they can find in Russia much to enrich their own lives, and to broaden their outlook on human affairs.

But the most potent agency for bringing our two nations together, and for giving English people the right idea of Russia and Russian life, has undoubtedly been the war. This great international calamity has brought about, not a rapprochement or a mutual understanding, but simply a union between the two nations, which has shown itself by a constant interchange of all that the two nations had, to assist each other at this most critical moment. Must we not remember with everlasting gratitude and emotion that Great Britain was ready to risk, and unfortunately did sacrifice, such an asset as Lord Kitchener, in her desire to benefit the Russian cause? And have we in Russia not sent our soldiers to fight along with our Allies in Greece, France, Mesopotamia and other battlefields? The meaning and significance of the friendship which binds the two nations together is, therefore, more than of a passing nature. It can be considered as having been brought about by elementary forces of Nature, outside the volition of man. That friendship has come to stay, I hope, for ever.

DISCUSSION ON BARON A. HEYKING'S PAPER.

MR. DRAGE said that it was his privilege to propose a vote of thanks to Baron Heyking for his excellent Paper, on the object of which there would be general agreement, not only in that meeting, but also throughout the country; but before doing so he would like to express his gratitude for the gift to the Society of the Russian Statistical Year Book, the eleventh of the series, with the accompanying volume of maps and diagrams, and the fifty years Statistical Survey of the Progress of the Russian Empire. If Baron Heyking had attended the last meeting of the Society, he would have discovered that they in Great Britain had reason to envy their Russian colleagues, for they had been trying, but so far in vain, to extract similar volumes from their own British Government. With regard to the Paper, there was one omission he hoped would be rectified later on. The Baron had given no account of the excellent system of Zemstvo or county council statistics which existed in Russia owing to the services of a highly-skilled body of local statisticians. He believed that their statistics were universally regarded as reliable and were accepted by the Central Government for administrative purposes. The taxation of land was based upon the valuations made in the Zemstvo offices, and these valuations are founded upon the statistics furnished by the Zemstvo statisticians. Unfortunately, in Great Britain, outside the London County Council, which had possessed before the war a small highly-skilled staff, no such body of local statisticians existed. Turning to the subject of the Paper, Mr. Drage said that all present were agreed as to the Baron's estimate of the resources of the Russian Empire and as to the desirability of closer relations between Great Britain and Russia. All present regretted that in the last sixty years Germany had supplanted the United Kingdom in the Russian market. But with regard to the future, they must face the facts and not underrate the strenuous efforts which the German octopus would make after the war to maintain its position. The plan of campaign was already prepared. After all, subtracting German Poland and Alsace, there would still remain a German population of 60 millions, supplying a disciplined army of plodding, laborious, thorough workers under highly-skilled leadership and control, for it is the officers of the industrial force, not the rank and file, that are trained by the German technical schools. People in England were apt to blame British business men for the retrogression of our trade with Russia, but how many persons had given a thought to the advantages possessed by the German merchants. In the first place, Germany was a *pays limitrophe* and the advantages of having a coterminous frontier were increased by the fact that, owing to the laches of our Government about commercial treaties, seaborne trade with Russia was placed by the Russian tariff under a disadvantage as compared with the land trade, and the disadvantage was increased by German preferential railway rates. Then there were the difficulties to be encountered in respect of the Russian language, of which there was in Germany a more general command than among our business men, owing partly to contiguity, partly to their want of application, and there were no less than 1,800,000 Germans living in Russia anxious to assist in spreading the trade of the Fatherland. Besides which, there were a vast number of German prisoners in European and Asiatic Russia who were known to be learning the language and studying the country with a view to commercial efforts later on. The German system of banks and credit gave a further advantage. The German banks were not deposit banks like those in England, but active partners in German trade, imbued with a missionary spirit for its furtherance and ready to give long credit for that end. Moreover, they had no scruples about placing spies in their competitors' banks and counting-houses and using the knowledge so obtained to undermine their competitors' credit. Further, they had obtained control of Russian key industries, such as electricity, in which they had invested 11,000,000*l.* sterling, and the chemical trades, in which they had invested 2,000,000*l.* Then, there existed the industrial associations called *cartels*, which combined their forces in order to sell dearly in Germany and cheaply abroad with the object of killing the undertakings and breaking the spirit of their competitors before taking their place. The result was that before the war the Germans had obtained a complete mastery of the zinc industry and a complete control of the great Dombrova coalfield. Lastly and above all, there was the active partnership of the Government and the universal, energetic, and systematic support afforded by officials to the German trader. This took the form of an ingenious system of dumping; for instance, in agriculture by means of the "einfurschein," a certificate of export made to bearer, which enabled the exporter or the holder of the certificate to import certain goods free of duty. Such certificates were sold to the value of 6,000,000*l.* in Hamburg alone in the year 1908, and thanks to them the Germans actually competed successfully with Russians in the sale of rye (of which Russia was far the greatest producer in the world) in the Baltic provinces, Finland and Poland, as well as in Norway and Sweden. Moreover, there was in the case of flour an ingenious plan, which could only be called over-dumping, by which the official standards were lower than the actual yield in the process of milling, and the State Custom House bore the loss involved. Under this system, the Germans milled Russian wheat, retained the bran, and successfully invaded the Russian flour market in Finland. There were in addition official subsidies and secret bonuses to German trade, and a Consular system on which no expense was spared and Embassies manned by experts skilled in extracting the utmost advantage technical knowledge could get from commercial trade.

These were all matters that our Government must consider and take action on before the end of the war. It was no use waiting till the end of the war and then beginning to move in the departments and Parliament. A thorough overhauling of the departments and services concerned should be undertaken, and, in addition, a commercial agreement should be made with Russia for the period of the war and five years after[1] to enable our business men to lay their plans beforehand. As things were, the public was far too much inclined to blame British business men for want of enterprise and far too little inclined to acquaint itself with the facts and take its own share of the blame. The difficulties of the British merchant must be borne in mind, for he had to face a hostile Russian tariff which, before the war, amounted to an average of 131 per cent. *ad valorem.* It had been raised by 10 per cent. since the war and now stood at 141. Englishmen made no complaint in this regard, for they had believed that Free Trade, the open door, was the best policy for them, while Russians had believed in Protection. At present Russian goods came free into England, while English goods paid very heavy duties in Russia. They quite understood that since the war an increase had been rendered necessary by the want of revenue. All he desired to say was that when it came to a commercial treaty, England had something to bargain with. Turning to the wish expressed that British money should be invested in Russia, Mr. Drage pointed out that of something like 38,000,000*l.*, which Great Britain had invested in Russia, the larger part was in Government loans (16,000,000*l.*), municipal loans (3,000,000*l.*), and railways (2,000,000*l.*), largely owing to the risk of faulty debtors and legal delays, and the drawbacks to which the Baron had referred. But even so our investment in Russian funds was small owing to the want of confidence in the relations between the two countries. Under present circumstances, more money was invested in Brazil than in Russia. The attitude of the British investor could best be illustrated by a report made by M. Witte, the Finance Minister, in February, 1899, of which he would read an extract[2]:—

"England is the only market in which Russia can find relief "for her present agricultural depression.

"England is not less important as a market for placing Russian "funds.

"The possibility of strengthening (commercial) relations depends "in England almost entirely upon public opinion, which is guided "much more by political than economic reasons, so that when "Englishmen feel a sympathy with any particular country they are "quite willing to purchase the products of that country and to "place their money in its funds. As soon, however, as their political "views change, they sell out their stock and put every possible "obstacle in the way of imports, even though in doing so they "may be obliged to pay dearer for goods from other countries."

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[1] *Cp. Ephemera*, 1915, p. 444.

[2] *Russian Affairs*, 2nd edition, 1904, p. 636.

The question then arose: What could the Russian Government do to encourage the British trader and the British investor? In the first place, there were changes to be made in the Russian tariff as a result of the Paris Conference. In the second place, the Russian Government could deal directly with the British trader or combinations of British traders. At present, the profits were often taken by undesirable German middlemen. Such a course had been recommended by our Consuls for operations of the Russian Ministry of Agriculture in the sale of timber. Thirdly, the Russian Government could issue some guide as to investments, and state into which industries it desired British capital should be put. Fourthly, it could remedy the legal difficulties and delays to which the Consul-General had referred. Lastly, we must remember that Great Britain is an Empire and that there was a rising trade between the Empire and Russia. The Australians were exporting meat and could also export fruit to Vladivostock. The Canadians were exporting binders and agricultural machinery, also to the same port. The Indian Empire already exported tea, jute, and could export natural indigo to Russia, while Burma exported rice, Ceylon tea, and Egypt cotton to the same country. In some cases, this trade would go direct, but in others, for instance jute, the German middleman had again stepped in. Him they must eliminate. Moreover, the Russian Government could divert the labour which now emigrated temporarily to Germany and also permanently through Germany to the United States to develop the fabulous wealth of Siberia. The British Government and British officials could also help. The Government could encourage the import of Russian sugar, not only in England but also in India, and a preference could be given to Russian products both in England and throughout the Empire. But this must be part of a systematic comprehensive plan of commercial treaties, such as he had long advocated as the means to bridge over the gulf between Free Trade and Tariff Reform.[3] The agreement should be made as soon as possible and should be for the period of the war and at least five years after the end of the war, as he had said, to enable our merchants to lay their plans beforehand. The Anglo-Russian Commercial Treaty of 1859 was out of date, and the most-favoured-nation clause, on which it relied, was defeated by the detailed provisions of modern tariffs.[4] Capital would no doubt be wanted after the war to develop our Crown Colonies and also at home, but the Government could direct its flow to Russia also, and could come to some understanding with our sister states who were competing not only at home but also in Russia in exports of agricultural produce. The British Empire and the Russian Empire could not only supply each other's needs, but, as he had observed some years ago in a speech to the students of the University of Moscow, there was ample room for both in Asia.[5] He did not pretend that these remedies would solve the problems they were considering. There was no panacea. In the long run, we should have to rely on the energy and enterprise of the British business man, who had put up a wonderful fight in the past. Business men would have the great help of public opinion on their side, and public opinion was just as powerful in Russia as in England. Public opinion was being educated by the various Russian societies, some of whom were represented at that meeting, who were doing an excellent work both in the learned and also in the commercial world. He believed that the more the English people and the Russian people got to know one another, the firmer the entente would be. After all, it was the people who settled these matters nowadays, and as those who knew the British Friendly Societies and Russian Artels would agree, there was the same spirit of fraternity, mutual support and brotherly love, the same spirit of patience and fair play, running through the working classes of both countries. That fellow-feeling would be cemented by the fiercest epoch of the war which now lay before us. For both peoples would recognize that in their joint victory there lay the only hope of future peace, the only hope of future civilization, and the only hope of the realization of Christianity, the religion they all professed.

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[3] *Cp. The Imperial Organisation of Trade*, 1911, pp. 113, 338.

[4] *Cp. The Imperial Organisation of Trade*, p. 101.

Sir WILLIAM CLARK, in seconding the motion, said that few men had done more than Baron Heyking to promote the economical relations of this country and Russia, and the labour entailed in preparing his Paper was no small contribution to that end. The Paper covered all aspects of the economical resources of Russia, and had reduced them to that statistical measurement which was so dear to the hearts of the members of the Statistical Society. Most people thinking of Russia had a general concept of immensity, but they had not a very clear idea of the exact extent of that immensity. He (the speaker) had travelled, many years ago, in the early days of the Siberian Railway, and spent three weeks coming from the Pacific to the German Frontier of Russia, and although that gave one a conviction of the immense size of the Empire, it was only that evening he had realized that in doing so one travelled 163 degrees from the East to the West. At the same time a journey like that gave some idea of the immensity of the Russian resources and of her hidden wealth. One passed day after day through the area of the black soil and saw the huge rivers, and realized in the mountains the possibilities of Russia's mineral resources. The Paper which had been read showed that, in thinking of Russia, it was necessary for one to think in millions, and the Statistical Society owed a great debt to Baron Heyking for having given in a compendious form so much statistical detail and information. Upon the question of British trade and German trade with Russia there were one or two points upon the statistical aspect of the case to which attention should be drawn. Baron Heyking had given figures for the imports into Russia from Germany and the imports into Russia from the United Kingdom. It looked as if he had used the Russian Returns, which showed the imports from Germany at nearly 68,000,000*l*., whereas in the export returns of Germany they were given as 48,000,000*l*. While he was reluctant to suggest that anything German could be more accurate than anything Russian, it was probable that a good deal of transit trade had got into the Russian figure, and that the imports of German products were not really as big as that figure suggested. The Russian figure probably included transit trade and a certain amount of imports from the free Port of Hamburg. Similarly, when one turned to the United Kingdom figures, the Russian figures gave imports of only 18,000,000*l*., while the export returns of the United Kingdom gave a figure of close on 28,000,000*l*. That was probably due to the fact that the Russian Returns only gave the direct imports, whilst our Returns gave exports to the country of ultimate destination. That meant that while the difference between the German imports and the British imports as shown in the Russian Returns was about 50,000,000*l*., making us 50,000,000*l*. to the bad, if one took the German and the British Returns we were only about 20,000,000*l*. to the bad. That was, of course, quite bad enough, and one should not lay too much stress on the discrepancy between the two sets of figures, because, after all, it arose mainly from the fact that the transit trade was in German hands, and that the merchanting and marketing of goods in Russia was done mainly by Germany. That was precisely what we wished to bring to an end. Mr. Drage had said, and it was unfortunately a very common opinion, that unlike the British Government, the German Government were heart and soul behind their traders. Whatever might have been the case with the British Government in the past—and in so far as they had stood aside it was not from apathy, but was a natural outcome of the spirit of the people, which was in favour of individualistic action, and traders of the older days disliked Government interference in any form—those days had come to an end, and one thing was certain, that the Government were now heart and soul behind the traders and wished to do all they could to help them. Their methods might be imperfect, but there was no doubt that they wished to do what they could to support them. They had the decisions of the Paris Conference, to which the Government intended to adhere, and the Government were giving every attention at the present time to the problem of how to pass successfully through the transition period from war to peace, and how in the future successfully to assist and push our foreign trade. There was plenty of evidence, too, that organization was going on among merchants and manufacturers as well. Mr. Drage had said a great deal about the organization of the Germans. No doubt they were organizing as much as they could for after the war, but there were clear signs that British manufacturers and traders were at equal pains to get themselves ready for what would undoubtedly be a great struggle. There was the Russo-British Chamber, one of the Vice-Presidents of which was present that evening, and no doubt he would be able to tell them about that. One heard of a good many missions to Russia, and on the Government side a mission had already been sent to Russia for the promotion of trade. The Indian Government, too, had sent a special mission to Russia to endeavour to arrange for raw materials for manufacture being sent direct to Russia, and to establish direct trade between India and Russia instead of its going to such a very large extent through Hamburg. In his (the speaker's) Department they received more inquiries about Russia than probably about any other foreign country. All that was undoubtedly to the good, but when one came down to the bedrock of the subject, it was clear that the German success depended more than anything upon the fact that their representatives lived in Russia, knew the language, and studied on the spot the requirements and needs and wants of their Russian customers. That had not been done hitherto to anything like the same extent by British manufacturers and traders. One very good sign of a change in that direction was that certain Chambers of Commerce were developing a scheme for sending over a certain number of young men from their centres to work and study in Russia and to learn Russian, and at the same time to receive here a certain number of young Russians to go through the same training in English in this country. They all shared the conviction which Baron Heyking expressed in the eloquent conclusion to his Paper, that one of the good results of the war would be that we should be brought into closer relations and should be able to preserve those closer relations. Trade, after all, was not an exchange of commodities between two distant countries in which the wants of the one would easily make themselves known and be met by the producing power of the other, but there must be close and constant intercourse, and that close and constant intercourse he felt sure we should get with Russia, arising directly out of our close co-operation in this great war.

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[5] *Ephemera*, 1915, p. 445.

Sir ALGERNON FIRTH (President of the Association of Chambers of Commerce and Organizing Chairman of the British Chamber of Commerce), in supporting the motion, expressed his thanks for the invitation he had received to be present that evening to hear the most interesting Paper which Baron Heyking had delivered. It had been a great pleasure to co-operate with Baron Heyking in the formation of the Chamber, and neither Baron Heyking nor Sir William Clark had overstated the desire that existed on the part of the British trader for such full information as was provided in the Paper. It should be circulated freely among the 500 firms who had already joined the Russo-British Chamber. The mere fact of the immense success of that Chamber so far and the support it had received showed that the British trader was awake to the importance of the opportunity that the Russian market provided for him. They were overwhelmed with inquiries in the same way as Sir William Clark's department, and many firms were doing everything they could to encourage the study of the Russian language, Russian methods, Russian mode of thought, Russian ways in every respect, and were preparing to deal with Russian trade, both import and export, on a very big scale as soon as this unfortunate war was over. They were all alive to the opportunity, not only to that for personal profit, but they recognized the immense value to civilization that a cordial, hearty friendship between those two great Empires would produce. It was that more than anything else for which they had to strive, and the material gain was nothing as compared with the moral and intellectual gain which would arise from a close friendship between the two countries.

Mr. G. DE WESSELITZKY said he was very glad to have been able to hear Baron Heyking's Lecture, and wished on behalf of many other Russian residents and of himself to testify to the warm and deep interest they felt in Baron Heyking's efforts to bring both countries to a still closer friendship. The activity of the Russian Consulate-General since the outbreak of war had increased a hundredfold. Great Britain seemed to have become nearer to Russia geographically, for while formerly a few Russians came to England, travelling through Germany and France, and stayed only a short time, now every Russian who wanted to get to any Allied or neutral country must first come to England, and many found it necessary to make a long stay. They all had to apply to the Consulate-General, and Baron Heyking was indefatigable in giving explanations and assistance. It was greatly to the credit of his working powers that he found time and energy to take the initiative in so many ways for the promotion of Anglo-Russian trade. Englishmen and Russians felt nowadays attracted mutually for many reasons, chiefly by the conformity of their ideas of right and wrong and of justice and injustice as exemplified in the present war. It was most fortunate that in following their sentiments they had no need to sacrifice any of their interests; on the contrary, they could serve their vital interests in no better way than by establishing on a firm, indestructible basis Anglo-Russian friendship. In doing that they were also providing the best safeguard for the independence and the liberty of all nations and the highest interests of humanity. With regard to Baron Heyking's interesting statement as to the natural resources of Russia, he (the speaker) would like to quote a passage from a memorial in his possession of a distinguished engineer who had, hammer in hand, walked through all the richest mineral regions of the world, and who, in the position of head of a most important petroleum well enterprise, had been able to compare the mineral wealth of Russia with that of other countries. That engineer said: "Ten years ago the "same quantities of naphtha were obtained in North America "as at Baku in Russia, that is to say, 10,000,000 tons in each "country, but with this enormous difference, that in America in "order to obtain that quantity it was necessary to exploit several "hundred thousand of square kilometres and to construct 60,000 "kilometres of pipe lines for conveying naphtha. On the contrary, "at Baku the same amount was obtained by exploiting only the "limited area of a few hundred hectares, and that with using very "few pipes. Now Baku is only one among the petrol-yielding "centres which can be exploited in Russia. There exist, indeed, "thousands of such centres which are just as rich as Baku and as "easily workable and on the same advantageous terms of pro-"duction and exportation at a small cost. We see, therefore, "that Russia, without spending the vast capital which had to be "sunk in such enterprises in America, will be able at any time to "increase her petrol production tenfold." Did not that example, added to many others, give the impression that former generations of Russians had been hoarding their natural treasures for the benefit of the present generation who, helped by their competent friends and Allies, would make extensive use of that heritage and gladly share it with those who had helped her.

The CHAIRMAN (Sir BERNARD MALLET) said it had given the Society great satisfaction to know that their distinguished visitor had found time not only to prepare such an interesting Address, but also to come there to deliver it. He was sure, however, that the Baron would not have grudged any amount of time spent in the effort to make more widely known in this country the advantages of a much increased commercial intercourse with the Russian Empire, and it was to be hoped that our people would rise to such a splendid opportunity. One was rather encouraged to hope that they would by the remarks which fell from Sir Algernon Firth and Sir William Clark. The members of the Society were glad at all events to have made some contribution to the good cause by the welcome they had given to Baron Heyking, and on behalf of the Society he wished to re-echo the eloquent sentences at the close of the Baron's Address, in which he advocated and justified the rapprochement between the two countries. He would like to add that the Allies had both sustained a very great loss in the death of Count Benckendorff, the very able and accomplished Ambassador who had represented Russia for so long at our Court, and to whom was very largely due the gratifying progress of the last few years in the friendship between Great Britain and Russia.

The resolution was put to the meeting and carried unanimously.

The following Candidate was elected a Fellow of the Society:—

Pyare K. Wattal.

THE RELATION OF INFANTILE MORTALITY TO MORTALITY IN SUBSEQUENT LIFE.

By JOHN BROWNLEE, M.D., D.Sc.,
Director of Statistics, Medical Research Committee.

[Read before the Royal Statistical Society, February 20, 1917, the President, Sir BERNARD MALLET, K.C.B., in the Chair.]

THE subject of infantile mortality is one of the very greatest importance. In the last ten years the problem of the waste of child life has come more and more prominently to the front. At the present moment administrative measures of all kinds are being taken with a view to save infantile lives. There are three points of view. Among many there is a strong opinion that every child's life saved adds another potentially fit member to the working power of the state. The holders of this opinion are at the present moment working for all they are worth to make proselytes. Such publicist action is not confined to those who have some right to speak in the matter, but it is a present-day fashionable fad for ladies of position and others who either have no children themselves or have had their children brought up by strangers in their houses to start societies to raise funds from the public with a view to popularize and extend some specious formula of quackery. Now it must be quite obvious that such persons, whether informed persons or enthusiastic ignorant persons, at best represent but one side of the truth.

There is secondly, as is only to be expected, an opposing group. The chief of these is Professor Karl Pearson, who seems to take quite definitely the view—I am sorry if I misinterpret—that measures such as those taken to save infantile life can only lead to an increase in the number of unfit persons whom the nation has ultimately to provide for. Such a view, if correctly interpreted, is as obviously onesided.

There is yet a third party, and this party maintains that, given moderately healthy conditions of life, the number of unfit is very much smaller than is assumed by Professor Pearson, and that the unfitness which develops is to a very large extent due to the environmental conditions to which the child is subjected during the early years of its life. To this party belong many of the most able medical officers of health in the country. One of these lately told me that if his Health Committee would give into his hands the whole money spent on health administration and allow him to allocate the spending, he would do more good in ten years than the present methods would do in thirty. Others temporize, and, though they feel that the best results by far will follow the systematic improvement of the general conditions of life, get caught in the vortex, and spend much of their energy in directions which their better judgment tells them give but a second best method of attack.

It does not concern us in this place, but the manner in which energy is being wasted brings a very grave feeling of misgiving regarding present-day tendencies. Hundreds of slums exist which should be cleared away, as there is no possibility of healthy human life in such places. Human death is the best incentive to sanitary reform, and if these present-day workers whose chief desire is to save infantile life, prove that a lower death-rate can be obtained in the worst slums, one of the most effective engines of progress will be put out of action for a generation, and many innocent children, unfortunately born under conditions which should not exist, will have to spend their early years in circumstances which are a disgrace not only to Christianity but even to the purely pagan deities of science.

It seems advisable, in view of these differences of opinion, that such statistical evidence as exists should be gathered together and criticized so as to determine how far any of these opinions are justified.

Now there are many documents relating to health conditions published between 1840 and 1900 which contain nothing to which modern statistics can offer a word of objection, documents which go to the root of the matter. Unfortunately with the beginning of the present century much loose thinking was introduced. The health officers were many of them men of narrow outlook, and in addition there was a new school of criticis, a school useful at the present moment, but not required had the health statistics been in the hands of the giants of last century.

The first work published on death-rates as indicative of natural selection from the pure statistical side was by Professor Karl Pearson. (1.) In this he showed from certain definite statistics that long life and short life are to a certain extent hereditary, giving statistical corroboration to a fact which had hitherto been assumed as so well known as not to need any proof, though not necessarily true on that account. Whatever the result of this statistical inquiry, however, has been, whether positive or negative, is immaterial for the purposes of the present inquiry, as the result has no bearing one way or another on the special problems at issue.

The next contribution was by Dr. Newsholme and Mr. Yule. Mr. Yule's contribution to this subject is, I think, much the soundest which has been made up to the present moment. (4.) Unfortunately, however, Mr. Yule felt compelled to say that the evidence at his disposal did not seem to justify any definite conclusion, and in this matter Mr. Yule's opinion must, I think, be taken as correct.

Following this, Dr. Snow published an investigation in which he came to the quite definite conclusion that the more children who die, below the ages of three years, the healthier the next five years of life. (7.) This communication will be discussed later. A point, which must be specially mentioned however in this place, is that he criticized Mr. Yule's statistics in that they applied to England and Wales as a whole. Not once but many times he returns to this point, and maintains that such a method obscures seriously the conclusions which might be ascertained from the evidence. In this he is right, but not I think for the reasons he alleges. In his next contribution to the subject Professor Pearson however takes his data from the life tables for England and Wales as a whole. In this communication Professor Pearson tries to show that infantile mortality exercises a definite selective effect. (6.) This paper was criticized by Dr. Newsholme, on the ground of the methods of measurement of the death-rates used, but he himself, however, did not put his criticism to the only useful proof, namely, that of arithmetical calculation. (5.) Later Miss Elderton and Professor Pearson, by applying the new method of Variate Differences, claim to have proved that the conclusion before arrived at by the latter is well founded. (3.)

It seems to me that the best method of proceeding will be to discuss the purely statistical evidence in the first place. The article of Professor Pearson in the Royal Society's *Proceedings* of 1912 will be taken as the text, the choosing of a text being clearly legitimately open to any author who has been born north of the Tweed.

A discursus, however, is necessary. It must be remembered that there is at present no sound method of measuring the mortality below 5 years of age. All are alike purely empirical, and much work will be required before any results which can be called scientific are arrived at. It is an undiscovered country from whose bourne if any traveller has returned it is quite certain that he has brought no exact information. This is usually not sufficiently realized by writers on vital statistics, and by the statisticians who determine to discuss the problem.

This uncertainty of measure, however, was quite well known to the founders of vital statistics in the middle of last century. They saw quite clearly the great difficulty in obtaining a method which was exact. All they could hope for was a measure which would serve their purposes, and realizing perfectly well that the figures they used were mere approximations, used them as such, not trying to draw conclusions unless they were satisfied that the statistics were such as to give a sufficient basis to enable them to hazard a guess. It is always a guess with Dr. Farr in England and with Dr. Russell in Glasgow. Both being men of great intuition, and the latter at least mathematically trained, their guesses are mostly correct. It is one thing, however, for such men to make approximations. It is quite another for their successors to take these approximations as exact results, and this is what has happened.

The measures which were chosen by these older writers were two: (1) the infantile mortality rate, which they defined as the ratio of the number of deaths occurring in each year to the number of births in the same year, expressing the results in parts per thousand, and (2) the childhood mortality rate, which was defined as the ratio between the number of deaths per thousand persons living between the ages of 0 and 5 years. More rarely they use the same ratio for the ages between 1 and 5 years. Both of these are very rough measures.

With these provisos the methods of measuring used or suggested for use at the present day will be defined.

Professor Pearson chooses the life-table figures as his basis, and he takes for the infantile mortality the number observed to die in these tables in the first year of life: this will be denoted by P_i. For the mortality between 1 and 5 years he takes the number dying during these years per thousand survivors to the age of 1 year: this will be denoted by P_c.

Dr. Newsholme objects, and calculates the infantile mortality by the usual method, namely, the number of deaths occurring in each year per thousand born. This being the method used by the Registrar-General will be denoted by R_i.

For the measures of the mortality between 1 and 5 years Dr. Newsholme takes the number of deaths between the ages of 1 and 5 years per thousand persons living at the age of 1 year, a figure obtained by subtracting the number of deaths under 1 year from the corresponding number of births: this will be denoted by N_c. One other measure of the mortality between the ages of 1 and 5 is the ratio of the number of deaths to the number of the population living at these ages expressed in parts per thousand. This being the usual method adopted by the Registrar-General it will be denoted by R_c.

In all the above a suffix i signifies the infantile mortality and c the child mortality, the capital letter denoting the authority.

As there is no essential difference between the results obtained by the different methods for the two sexes, the figures which follow refer solely to the male sex. This has been done to save labour in calculation.

To return now to Professor Pearson's paper. He, as we have seen, takes first, from the life-table, as the infantile mortality, the number of those born who die in the first year per thousand born: this will be termed P_i. Secondly, the number of the same population who die between the years 1 and 5 years of age in proportion to the number living at 1 year of age, this is termed P_c; and thirdly, the expectation of life at the age of 6 years, termed hereafter E_6. He calculates the correlation between each of these pairs for the four English life-tables 1838–54, 1870–80, 1880–90 and 1890–1900, and then proceeds to calculate the partial correlation coefficient between the infantile mortality and child mortality on the assumption that after the age of 6 the expectation of life is constant. He arrives at the conclusion that there is a high negative correlation between the infantile death-rate and death-rate in childhood—in other words, that the infantile death-rate exercises high selective influence. Dr. Newsholme has criticized this paper on the general ground that the method of estimating the mortalities is not sound, but before discussing his objection it is necessary to eliminate another possible source of fallacy. The life-table of 1838–54 represents different conditions. The population of England was much less urbanized; further there were great epidemics of diseases attacking adults: cholera, typhus, &c. This table cannot, therefore, be placed in rigid comparison with the later three tables; this objection, however, can be removed by replacing this life-table by a later life-table published since Professor Pearson's paper was written—namely, the life-table referring to the ten years 1900–10. It is found, using Professor Pearson's method, that this change introduces practically no difference, the value of the partial correlation obtained by Professor Pearson being $-{\cdot}86$ and that obtained by the same method with the different data being $-{\cdot}92$. This, therefore, does not furnish any source of error, as the difference found is hardly worth considering.

Taking, then, the four life-tables 1870–80 . . . 1901–10 as a basis, we have the following results:—

$$_{E_6}r_{P_iP_c} = -{\cdot}92. \qquad _{E_6}r_{P_iR_c} = -{\cdot}33.$$

$$_{E_6}r_{R_iR_c} = -{\cdot}59. \qquad _{E_6}r_{R_iN_c} = -{\cdot}01.$$

The difference between the correlations found by Professor Pearson's method of measurement, namely $-{\cdot}92$, and that obtained by the Registrar-General's method of measurement is not great, the latter being —·59, quite sufficient for all practical purposes. When, however, the methods are mixed and P_i and R_c are calculated, the partial correlation falls from —·92 to —·33, while when the measures suggested by Dr. Newsholme are used the resulting correlation is —·01. In other words, there is no selective influence in the infantile death-rate. Dr. Newsholme distinctly scores, but the ground is more than treacherous. The complete figures are shown in Table I.

Positive correlations can, however, also be obtained by using the same data in a different manner.

Before showing how this is possible, however, a note on a point in the methods of construction of a life-table is necessary. In calculating infantile mortality and the mortality between 1 and 5 years, the data used in the construction of a life-table do not refer wholly to the same persons. Those children born between 1891–95 inclusive have their life history completed in the data of the life-table for the first five years of life, but there is in addition a series of children born in the previous decade who die in the epoch of the life-table and a series of children born in the epoch in question who die in the next decade. The data are, therefore, not based on the same persons. It is necessary to mention this because I propose to use as a check to Professor Pearson's method the data for the whole of the county districts of England and Wales for the two decades 1981–90 and 1891–1900, and in doing so am using figures open to the same objections.

England and Wales are divided by the Registrar-General into forty-five county districts. The infantile mortality for these is known, while the mortality occurring between the years of 1 and 5 can be calculated either by Dr. Newsholme's method on the 1,000 survivors at 1 year or by the method ordinarily employed by health authorities. It is, in addition, comparatively easy, adopting the method I have previously given, to obtain the expectation of life at 5 years. (29.) This is not quite the same quantity as that used by Professor Pearson, but the correlation between the two is so nearly unity that no error is introduced, the value obtained on the life-table data being $_{E_6}r_{P_tP_c} = -\cdot92$ and $_{E_5}r_{P_tP_c} = -\cdot87$. Employing Professor Pearson's method with the figures for the counties, it is found that instead of obtaining negative partial correlation coefficients, coefficients are obtained which are positive and nearly as great in quantity apart from sign as those found by Professor Pearson.

We have for the decade 1881–90 :—(*cf.* Table II.)

$$_{E_5}r_{P_tP_c} = +\cdot69.$$

$$_{E_5}r_{R_tR_c} = +\cdot67.$$

And for decade 1891–1900:—

$$_{E_5}r_{P_iP_c} = + \cdot 71.$$

$$_{E_5}r_{R_iR_c} = + \cdot 73.$$

One other example will be given to illustrate the variations found. Glasgow is the only city in which the statistical districts were based on sanitary considerations. The range of mortality in these districts was in the seventies and eighties of last century very great. The data are not given in complete detail but in sufficient detail to allow the same correlations to be calculated. The result in this case is that the partial correlation is zero.

Where then lie the sources of error?

Firstly, as already stated, there is no known method of measuring the mortality in infancy and childhood, with any of the accuracy which is required in investigations of this kind. I have worked at this subject on and off for many years, and while I have obtained approximations for the period of childhood, I have hitherto failed to obtain even a working measure of the infantile mortality. I doubt if the data in existence are sufficient. There is, further, absolutely no doubt in my mind that the method is fundamentally fallacious. There is no possibility, as far as I see, in calculating partial correlation coefficients on the assumption that the expectation of life at the age of 6 can be taken as constant. Life is a very complex phenomenon, and the death-rates at different ages are so closely related organically that different factors cannot be separated. A child brought up in a slum till over the age of 7 before it is boarded out in the country has been found in the experience of the parochial authorities of Glasgow not to maintain the same health as a child of 3 taken from the same environment. A child in a slum thus, whose parents die when it is young, has a better chance in after life than if its parents survived until it reached the age of 7. This accords with my own clinical experience. It will be noted by reference to the table that the correlation between the death-rate at the ages of 1 to 5 years as given by any of the methods suggested and the expectation of life at 6 years of age is practically absolute. In the various examples given in the tables associated with this part of the paper the values obtained by different methods range from ·992 to ·997. This degree of association is almost as absolute as the association between the phenomena of the solar system and the law of gravity, when the difficulty of knowing exactly how to measure the death-rates in childhood is allowed for. Partial correlation coefficients thus cannot be computed by considering the expectation at 6 years of age constant. I think such a method as arbitrary as trying to correlate the perturbations of Saturn and Jupiter after eliminating the law of gravity. How the problem will ultimately be solved is yet unknown, but I have no hesitation in saying that the application of such an extremely crude method as the method of partial correlation coefficients will never enable us to unravel the complexity.

This, however, is not all; there is a further serious defect in this contribution which must be mentioned. Professor Pearson wholly neglects the epidemiological aspect of the statistics. The data on which the arguments are based were data referring to a period in which mortality in childhood was subject to special conditions. There seems no doubt that a great epidemic of infantile diarrhœa occurred in the years 1891–1900. A great many more infants died of the disease during the period of this epidemic than in either of the other three decades. A study of the causes of death as issued by the Registrar-General leads me to believe that this is a genuine phenomenon, and not due to a change in the nomenclature of disease. This introduces a factor of which so far there have not been any serious attempts to measure the effect. Guesses have been made by myself and others, but no evidence of any great value has hitherto been presented as to the effect infantile diarrhœa exercises in eliminating the unfit. We clearly have no right to use figures which contain a large element of uncertainty of this kind without special care. Some estimate of the effect which this epidemic produced is necessary. Again, there is no statistical method of any importance. It is clearly not legitimate to deduct the infantile mortality due to diarrhœa from the total infantile mortality and recalculate the correlations, but it is permissible to inquire into what the effect of this procedure would be. With the notation hitherto adopted, it is found that ${}_{E_6}r_{R_iR_c}$, in place of being equal to $-\cdot 59$, assumes the value $-\cdot 10$, and ${}_{E_6}r_{R_iN_c}$ changes from $-\cdot 01$ to $+\cdot 37$. All evidence of selection thus disappears, but it must be remembered that no trust can be placed on this result. The calculations show, however, that the introduction of this epidemiological feature must be specially considered in any future attempts to measure the influence of selection.

From this maze of partial correlation coefficients the defender of their use may escape as he will. It is a veritable labyrinth of Knossos, and there seems to be no Ariadne to supply a clue.

The next important paper upon the subject is by Miss Elderton and Professor Pearson. In this paper the subject is attacked by a new method, termed the method of variate differences.

The reason of the introduction of this method is that there are many groups of phenomena which may possibly be correlated but which are subject to some influence which causes changes as time progresses. This is well illustrated by the example which is at present being considered, as the death-rates at nearly all ages and especially under 5 years of age have been decreasing steadily for many years. The death-rates under 1 year of age were the last to show evidence of this change, but during the last fifteen years a marked decline in this rate has also taken place. Consequently if we seek to correlate the death-rate between 1 and 2 years with that between 2 and 3 years a high positive value of the correlation coefficient is found, the steady fall in all the death-rates bringing about a false correlation which need mean nothing more than that the causes which have produced the phenomena act more or less equally in both cases. It is, therefore, important to have some method by which this kind of influence can be eliminated. Various methods have been suggested, but all are more or less open to fallacy. If a new method, not subject to fallacy, could be introduced it might be extremely useful. With this end in view the method termed that of variate differences has been suggested and used, but I think I shall be able to show that this method is open to even greater doubt than some rougher and less difficult tests. The advantage of a rough method is that the whole mechanism of the process is open to inspection, so that a fallacy, if not perceived by the author, is easily found out by the critics. When, however, an elaborate machinery, such as that of the method of variate differences, is introduced, it is often quite impossible to determine whether the assumptions on which the method is based are fulfilled in any particular case, or whether some hidden factor may not be in action which invalidates the use of the method. For myself, for reasons presently to be stated, I place no trust in any result obtained by this process. It belongs to the type of reasoning of which Poincaré has said—" mathematics are sometimes a nuisance."

Briefly described, the method is as follows. Let there be two series of terms x_1, x_2, x_3, &c., and y_1, y_2, y_3, &c. Let to both of these a time factor be added capable of being expressed in a few terms of Maclaurin's series. The additional variation introduced by this time factor can be obviously eliminated by taking the successive differences of the terms. It is evident from this that the time factor added to each series need not be the same. It can also easily be proved that if the correlations between the series x_1 and y_2, and between the series x_2 and y_1, &c., are zero the correlations of the successive differences of the two series will be equal to that between the series of terms x_1 and y_1, x_2 and y_2, &c. It is also obvious that if there be any periodic factor the process will not hold, inasmuch as correlations will exist between terms assumed uncorrelated in the theory. The method is not, therefore, applicable in such cases. The assumptions made further are very extensive. In general, it will be impossible to prove that no correlation exists between x_1, y_2, &c., and if such correlation does exist the results obtained by the method will be quite fallacious. These points will be illustrated presently.

The application of the method made by Professor Pearson in this instance has been to take the death-rates in England and Wales for each yearly age period from birth to 5 years of age and tabulate these so as to compare the death-rates at each age belonging to the same group of births as age advances. Thus taking the number of births he subtracts the number of deaths occurring under 1 year, thereby obtaining the number of those who start the second year of life. From this number the deaths between the age of 1 and 2 years after birth found in the tables of the Registrar-General are next subtracted. This process is continued. The death-rates are obtained by dividing the number of deaths occurring in each year by the number of individuals living at the beginning of that year. The correlations between the death-rates themselves and between their successive differences up to the sixth difference have next been calculated. The correlations between the rates themselves are positive, but with each successive difference a larger negative value is obtained till the fourth difference is reached, after which the correlations remain constant. The time factor thus seems to be eliminated. High negative correlations are uniformly found. Such agreement need not, however, mean anything if the method by which the results have been obtained is untrustworthy. It is assumed that these correlations show that a higher death-rate in one year of life is associated with a lower death-rate in the next year of life.

Professor Pearson makes a short note on the question of periodicity. He says his results are not invalidated on that account because he has not found any evidence of such periods. I have no doubt that periodicities in the neighbourhood of two years might be found if the data were sufficient, but the figures relate to whole years and it is very difficult to determine the length of a period with such statistics. A biennial periodicity, however, can be observed between the years 1870–90. Adding the death-rates in columns in alternate years and observing the differences in the sums relative to the mean value, a small but quite definite amplitude is found is each series of death-rates. If such a periodicity is due to biennial epidemics it should alternate with each year of age. Thus if between 0–1 years the maximum was in the first year, it should be in the second between 1–2 years and again in the first between 2 and 3 years, &c.

This is exactly what occurs, and it is found in spite of the fact that as all the death-rates have been steadily declining a constant excess would be expected in one column of sums over the other.

Special criticism of the method will now be made. In the first place some of the components of the death-rates will be examined. There are three infectious diseases in childhood which cause very considerable mortality in successive years of age, zymotic diarrhœa, measles and whooping cough. With zymotic diarrhœa the mortality is chiefly at the age periods 0–1 and 1–2 years; with whooping cough the same holds; with measles the chief period of mortality is in the age period 1–2 years, the age periods 0–1 and 2–3 years being of practically equal importance though of less importance than the period between. The working of the method can be tested against the figures for these diseases, and in this way some of the results obtained interpreted. As the calculation of the correlations of all the differences is very laborious and as the fourth differences were found by Professor Pearson to give a satisfactory approximation, the correlations of the death-rates themselves and of their fourth differences have alone been worked out. Probable errors have not been calculated as I have no belief in the processes by which they have been obtained.

The statistics relating to zymotic diarrhœa will first be discussed. This is a disease which occurs every summer or autumn in greater or less amount, the amount of the disease depending in general on the warmth of the early part of the summer. No definite periodicity other than this has hitherto been demonstrated, but it seems probable in view of the fact that I have hitherto found periodicities in all the cases examined that, when I have a clerk at liberty to undertake the work, true diarrhœic periodicities independent of the solar year will be found. The outbreaks, however, occur sufficiently often in large epidemics in alternate years on account of climatic variation to introduce false periodicity which must have exactly the same effect in bringing about a false selective result as a true periodicity would.

The disease is about equally common at the two age periods 0–1 and 1–2 years, though very much less fatal in the latter age period. If 10 per cent. of the infants are affected, assuming that an attack one year establishes some immunity for which there is some evidence though the fact is doubtful, then with the rough periodicity of 2 years the selective correlation should be in the neighbourhood of $-\cdot10$. That found for the whole of England and Wales is $-\cdot16$, a value not out of the way, but the correlation between the fourth differences is equal to $-\cdot91$, a value which cannot be conceived, apart from some correlated variation in the occurrence of epidemics. It would seem that zymotic diarrhœa furnishes a large component to the selective figures as estimated by Professor Pearson between the infantile mortality and the mortality in the year of life following. When the deaths from diarrhœa are subtracted from the total deaths at the first two age periods the correlation between the actual death-rates becomes + ·80 and that between the fourth differences – ·22, in place of + ·40 and —·66 found by Professor Pearson. During the years 1850–89, years preceding the great epidemic of zymotic diarrhœa and years in which quite marked biennial periodicity is observed in the diarrhœa deaths, the correlation between the same quantities is even higher. The correlation between the actual death-rates is – ·36 and between their fourth differences – ·93, while the corresponding values for the total death-rate when the death-rate from diarrhœa is subtracted are respectively + ·52 and – ·11. The selective influence of infantile mortality thus very largely disappears. This process of subtraction as used in this place is not legitimate, but the fact that it produces so profound a difference in the results shows that no mere statistical process unless accompanied by an adequate discussion of the epidemiological concomitants can be relied on to furnish results of any validity. The complete failure of the method, however, will be more definitely seen when two measures which cannot possibly have any connection are correlated, namely, the death-rate between the years of 1 and 2 years and the death-rate under the age of 1 year for the epoch for 2 years later. The correlation between the actual death-rates is – ·06, *i.e.*, the two are independent as would be expected, but the correlation between the fourth differences is – ·76.

Finally, making some calculation for London specially it is found that the correlation coefficient between the fourth differences of the death-rates for diarrhœa at ages under 1, and that between the ages of 1 and 2 years for the year following, is equal to – ·83, while when the death-rates under the age of 1 year of age are correlated for successive years the value found is – ·87 which does not differ from the preceding. Yet in this latter case there can be no question of selection. The periodicities due to weather and as yet undiscovered causes are thus quite capable of explaining the values of the correlation coefficient found.

The same phenomena are found when the death-rates of measles are studied. The correlation coefficients have been calculated for the age periods of 1–2 and 2–3 years on the same basis as that used by Professor Pearson. In the actual figures the correlation between the number of deaths between the ages 1 and 2 years in one year and that between the ages of 2 and 3 in the next year is $-\cdot16$. The figures which would result if epidemics of different size were random phenomena distributed according to the normal curve of error would be in the neighbourhood of, though in all probability less than, $-\cdot1$. The coefficient thus tells little. When the fourth differences, however, are correlated the correlation is found to be $-\cdot83$; that is a value is found quite impossible unless very considerable periodicities exist or unless there is correlation among the terms which are presumed by the theory to be uncorrelated. This is a specially important case, as the time factor here consists of two large long waves. There is at present no evidence that the death-rate from measles is permanently declining.

With whooping cough the correlations between the death-rates at 0–1 years and 1–2 years show similar values, that between the actual death-rates being $+\cdot15$ and that between the fourth differences $-\cdot67$.

A further check on the method is afforded by the statistics of London and for this city I have determined the main periodicity of two of the chief epidemic diseases, namely, measles and whooping cough. The statistics of the death-rates under 5 years of age have been reduced by exactly the same method as that employed by Professor Pearson for the whole of England and Wales. It is found that the values of the correlation coefficients both for the actual death-rates and for the fourth differences are practically identical with those for all England. Now a large part of the death-rate in childhood in London is due to two diseases, measles and whooping cough. The main periodicity of measles is 97 weeks and the mean range of variation from the minimum to the maximum is in proportion of 6 to 14 so that the average maximum in the epidemic period is more than twice that of the minimum in the inter-epidemic period. This is, therefore, a sufficiently definite period. With whooping cough the period is somewhere in the neighbourhood of 100·3 weeks; the amplitude in this case is not so great, the range of variation being expressed by the proportions of 74 to 126 an amplitude of considerable magnitude. Both of these periods in the sum are very closely sine functions, and on the hypothesis that the epidemics themselves can be represented by such a formula, it is easy to estimate the correlation between the number of deaths occurring in one year and those of the same generation in the succeeding year. The approximate value of this correlation is $-\cdot98$. Now such a periodicity cannot wholly be overshadowed by the mass of deaths from other causes, though the effect may be obscured to some extent. The effect will be best seen in the differences. The negative values of the correlation coefficients found seem to have an explanation in the ordinary variation in the amount of the infectious diseases of childhood. It may, however, be stated that the epidemic constitution of the death-rate has a large biennial component. If we correlate the death-rate between birth and 1 and 1 and 2 years and 1 and 2 and 2 and 3 years for the same years we get in the first case a correlation for the actual death-rates of +·6 and for the fourth differences of +·5 and in the second case correlations of +·96 and +·93 respectively. Where the correlations are calculated with an interval of 2 years between the same age periods the corresponding values are +·40 and +·16 and +·86 and +·42. There is thus a very marked tendency, especially in the second group of age periods, for the deaths to show a biennial variation. This effect had hitherto been assumed as well known. The statistics of London thus give strong verification to the view that the results obtained by the method of variate differences are quite sufficiently explained by the epidemic constitution of the year.

I have discussed the results of the method of variate differences at some length because I fundamentally distrust it. I know of no phenomenon in vital statistics which can in the least be said to fulfil the canons implied in the definitions of validity, which require that the correlation between all the terms except those directly correlated is zero and that the time function is additive. With reference to the latter point the case of scarlet fever may be taken. In this disease the death-rate has very markedly fallen in the last forty years, the rate of fall being closely described by a geometrical progression. The range of swing above and below the mean value at any time has also greatly declined, being now but a fraction of what it was in 1870, so that not only has the mortality fallen but the proportionate swing has also fallen. Such a condition obviously cannot be described by a variable factor added to a time factor. The same holds in all the other cases which I have examined.

The question of the validity of the method is of much importance to this Society. It is being applied to railway statistics, imports, &c., and it will, if not thoroughly scrutinised, probably lead to conclusions being pressed for which there is no adequate evidence.

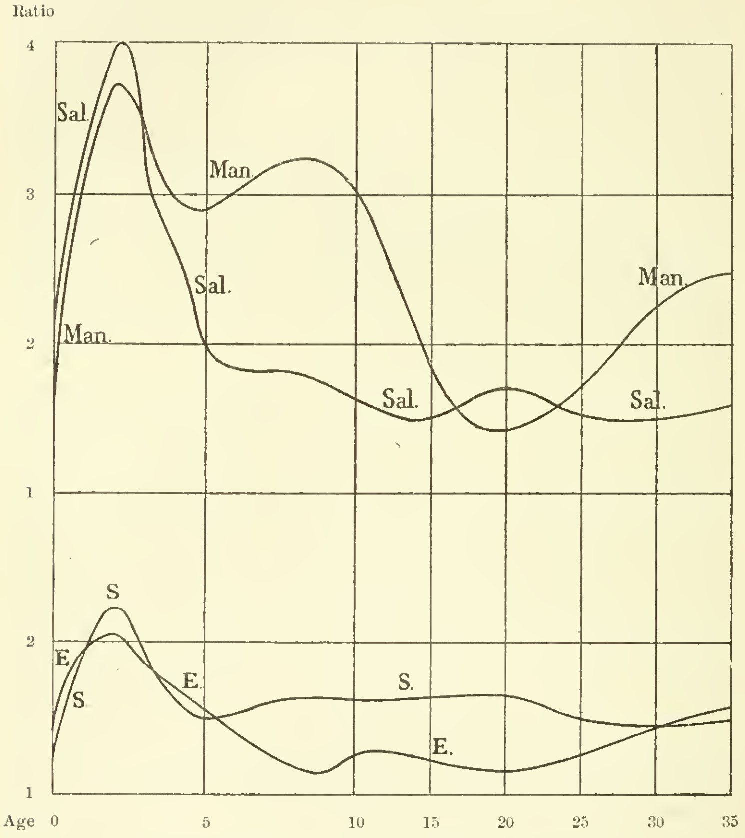
It is now possible to consider Dr. Snow's Paper. The chief part of Dr. Snow's Paper is taken up with a discussion of the effect which mortality under 3 years of age has upon the mortality during the fourth and fifth year of age. For this purpose he divides the country up into urban and rural districts. He finds in the rural divisions that a very marked negative correlation between the earlier and later period exists. He explains the absence of correlation in urban districts by the emigration and immigration which is constantly taking place. The data he chiefly examines are those referring to children born in 1870. These he follows through the first five years of life. He, however, does not consider at all the epidemiological aspect of the matter, and thus fails to clear his evidence of an important source of fallacy. The results he obtains are results such as might be easily anticipated. In the country districts epidemics of measles and whooping cough occur at much longer intervals than in towns. In general, for a country district to be infected a new source of disease must be imported, while in towns measles and whooping cough are always present and occur roughly at intervals of two years. In correlating the mortality under 3 years with that during the fourth and fifth years of age Dr. Snow thus arranges the data in a form which greatly increases the difficulties of disentangling the effects produced by the presence of epidemic children's diseases. As these are among the most important causes of child mortality it is evident that a large part of the correlation observed must be due to these diseases. If the epidemics occur in the country at intervals of 3 years or longer, it is quite obvious that a high mortality under 3 years of age will be associated with a low mortality in the fourth and fifth years, and *vice versâ*. The negative correlation obtained from the statistics of the country divisions is, therefore, what might be expected, and the absence of correlation found in the statistics of the towns might also be explained on the same hypothesis of more frequent epidemics. Dr. Snow's treatment of the statistics of the Prussian rural districts is open to exactly the same objection.

These methods hitherto discussed seem to give no kind of trustworthy answer. The question therefore remains, whether the subject can be approached in any other way. This I attempted in a previous paper by comparing the death-rates in the different life-tables which relate to districts possessing more or less similar health conditions. (26.) I hoped in this way to be able to compare the mortalities at all ages of life in different places by taking some such standard as a Healthy District Life-Table. The method seemed promising, but on re-consideration of the subject I can only come to the conclusion that what I wrote cannot be justified. In the accompanying diagram the death-rates in the life-tables for Scotland and for England and Wales for the decade 1891–1900 are compared. In Scotland there was during this decade a much lower mortality under 1 year of age than in England. The mortality at 2 years of age was greater than that in England, while during the long period between 10 and 35 years of age the mortality was very much higher in Scotland than in England. It looked as if the large saving of infantile life was followed by a period of higher death-rates reaching to early adult years. This conclusion is fallacious. When I wrote I had not studied the statistics of phthisis in any adequate manner, I did not know that phthisis was not one disease but a mixture of two or probably three diseases, as I am now certain it is. Epidemics of these two diseases affect different districts of the country in different proportions. One type of phthisis has its highest mortality between 20 and 25 years of age. This is the type which is most prevalent in Scotland. The other type, which is typical of London, causes the maximum number of deaths in the neighbourhood of 40 years of age. The two, therefore, vary in a manner which is quite distinct. This introduces a complicated factor. I do not think it could be urged, except as a matter of special pleading, that a low infantile mortality conduces to a high death-rate from that form of phthisis which attacks at the earlier years of life and not from the form which affects the middle ages of life.

The second instance, which I thought even more convincing, must also be rejected, its use being due to a mistake. The data of the life-tables referring to the mortalities in Salford and Manchester at different ages were compared. These data are illustrated in the diagram (page 238). It will be noted that Salford has a much higher death-rate in infancy than Manchester and in compensation thereafter the Manchester death-rate is very much higher between the years of 5 and 15. Unfortunately, my memory played me traitor, and I forgot to notice that these two life-tables referred to different decades, that of Manchester referring to the decade 1881–90, and that of Salford to the decade 1891–1900. Had this not been so an almost typical experiment would have been observed in progress, Salford and Manchester being essentially the same town. The differences found seem to be due to epidemiological causes. In Manchester in the decade 1881–91, there were 4,011 deaths between the ages of 5 and 10 of which 692 were due to scarlet fever, in the next decade the corresponding figures are 3,154 and 344, giving a net fall in the number of deaths of 857, of which nearly half, 348, were due to scarlet fever. Secondly, the great epidemic of zymotic diarrhœa occurred between the years 1890–1900 and affected Salford like the rest of the country. There are thus two completely different epidemic constitutions in the two decades. Comparison of figures without reference to epidemiological variations can thus only lead to results of little significance. Different epidemics occur according to their own laws and cannot be assumed to offer protection or the reverse against one another. There is at present no evidence at all

DIAGRAM I.

Illustrating the ratios of the death-rates in the life-tables of Manchester, 1881-90, *Salford, England, and Scotland,* 1891-1900, *to the corresponding rates in the Healthy District Life-Table, England,* 1891-1900.



Sal. = Salford. Man. = Manchester.
S. = Scotland. E. = England.

that any epidemics are continually associated. What looks like an association in one place is often due to the existence of periodicities of similar lengths with two diseases, and if sufficient investigation is made it will in many cases be found that the association observed in one place for a number of years has no parallel elsewhere. The origin of periodicities in disease is at present not settled. In my belief it is due to variations in the infectivity of the organism which attacks, though it can also be argued that decline of the disease is due to the exhaustion of the susceptible persons, and its return to the fact that a new susceptible population has grown up. Whatever the causes it is none the less necessary to note that the phenomenon is independent of selection. The same conclusion must, I think, apply to any methods that can be suggested. If we could make a direct experiment some information might be obtained, but as long as we are dependent upon the statistics of deaths and as long as the epidemiology of diseases is a subject so little worked as at present, so long any conclusions advanced must remain doubtful. For instance, if phthisis is more than one disease it follows that any statistical work upon phthisis which does not recognize this may be open to fundamental fallacy.

The most important work on this subject has now been discussed. The result of the enquiry has been to throw great doubt on every method which has been proposed to measure the influence of the death-rate as a selective agent. Personally I do not see how any accurate information is to be obtained. Experiment, were it possible, might solve certain of the questions, but even where something analogous to experiment has taken place the data are rarely presented so as to be statistically useful. For my own part I am very strongly of opinion that the improvement of environment is the most important measure with a view both to the procreation and the maintenance of a healthy race and that no effort can be too great to accomplish this improvement. The desirability of saving infantile life when that life must be lived under conditions which are incompatible with healthy human life seems very doubtful. It is a waste of effort to save life when the individuals are brought up so as to be incapable of exercising the useful functions of citizenship. Improvement of housing and the provision of open spaces should be the main line of action. It is quite true that during the war not much can be done in this direction, but I am quite sure that as soon as the war is over the older sanitation will again come into its own.

Finally, it is my strong opinion, having examined all the different methods in use, that unless a very careful investigation is made into the epidemiology of any series of health statistics no estimate of selective influence can be of the least value.

NOTE.—*On the Value of the Infantile Death-rate as a Mathematical Measure.*

This note is added to make clear that I have no objections to the infantile death-rate as a measure of healthiness or unhealthiness of an environment as it is commonly used in public health statistics, but that my objection is to its use as a mathematical measure forming the basis of rigid statistical deduction. For practical purposes it is a most convenient figure, and with reasonable care furnishes a sound guide into sanitary conditions. It has probably been of more direct importance in determining municipal measures and general legislation than any other figure. There is, however, a great difference between a guide for practical purposes and a mathematical measure. For the latter a much more rigid method of deduction is obviously necessary.

The reason of the difficulty is as follows. Though the methods by which death takes place under one year of age has not as yet been unravelled, there is one point which is well recognized, and that is that two completely different processes exist by which death takes place. In one of these the chance of dying from certain diseases decreases from birth, in the other it increases. Further, under the age of 3 months there is not much difference between the town and the country; a greater difference appears between 3 and 6 months and a still greater in the last six months of the first year of life. It is also to be noted that about the fifth or sixth month a marked change takes place in the physiology of the infant. Children under 5 months, for instance, even though exposed to infection, hardly develop measles; children over 6 months are just as susceptible to the disease as in the following year of life. This applies also to a number of other diseases. Not only is this the case but the mortality changes in the same striking manner. The case mortalities in the four quarters of the first year of life are respectively, in the figures of Dr. Hay of Aberdeen, 7·8, 9·8, 14·7 and 18·2. In my hospital experience the difference is even more striking, the corresponding figures being 10·0, 9·3. 21·3, 24·3. It also is to be specially noted that in the second six months of life diseases which are undoubtedly infective such as broncho-pneumonia, &c., play a more prominent part in the total mortality. It is in these months that an unhealthy environment tells most against the life of a child. This is illustrated in Table I, in which the proportions of the total deaths occurring at certain periods during the first year of life are shown for the urban and the rural districts of England—the figures are those of the Registrar-General for the year 1909.

TABLE I. *Showing the percentage of the total deaths under* 1 *year of age which occur in certain specified age-periods for the urban and rural counties for the year* 1909.

Age-period.	Urban.	Rural.
0– 1 month ...	34·4	41·5
1– 3 months ...	18·7	19·9
3– 6 ,, ...	12·2	11·2
6– 9 ,, ...	10·1	8·3
9–12 ,, ...	9·1	6·4

In view of these facts it would seem that the death-rates at each month under 1 year of age may be represented as the sum of two functions. It seems obvious that when at least two different conditions determining the death-rate are mingled in this way, no rough and ready criterion such as is obtained by dividing the total number of deaths by the total number of births can be taken as a mathematical measure. I have certainly never in a purely mathematical matter seen any such procedure suggested.

With regard to the death-rate betwen the years of 1 and 5 almost exactly the same remarks apply. When we consider the returns of the Registrar-General we find that the form of the curve which describes the fall of the death-rate in these years varies within such wide limits as to preclude any but rough comparisons. It is only after the age of 4 is reached that the slope of the curve giving the number of deaths changes sufficiently slowly to permit the death-rate as usually calculated to be taken as a basis of mathematical development.

TABLE II.—*Showing the correlations between each pair of the following three measures: the infantile death-rate, the childhood death-rate, and the expectation at* 6 *years of age taken from the life-tables for England and Wales*, 1871-80—1901-10.

Notation: Suffix *i* means infantile mortality; suffix *c* means childhood mortality; E expectation of life; suffix figure the age from which expectation taken; P, N, and R refer respectively to the methods of calculating the death-rates suggested by Professor Pearson, Sir A. Newsholme, and the Registrar-General.

(*a.*) ENGLAND AND WALES.—As calculated by the different measures used or suggested.

1838-51—1891-1900.			1871-80—1901-10.			1871-80—1901-10.		
$r_{P_iP_c}$	−	·6359	$r_{P_iP_c}$	+	·4358655	$r_{P_iR_c}$	+	·4997350
$r_{P_iE_6}$	+	·5620	$r_{P_iE_6}$	−	·5233236	$r_{P_iE_6}$	−	·5233236
$r_{P_cE_6}$	−	·9941	$r_{P_cE_6}$	−	·9942197	$r_{R_cE_6}$	−	·9969259
${}_{E_6}r_{P_iP_c}$	−	·8605	${}_{E_6}r_{P_iP_c}$	−	·92288	${}_{E_6}r_{P_iR_c}$	−	·32921

1871-80—1901-10.			1871-80—1901-10.		
$r_{R_iR_c}$	+	·6934197	$r_{R_iN_c}$	+	·7202381
$r_{R_iE_6}$	−	·7273973	$r_{R_iE_6}$	−	·7273973
$r_{R_cE_6}$	−	·9969259	$r_{N_cE_6}$	−	·9917431
${}_{E_6}r_{R_iR_c}$	−	·59037	${}_{E_6}r_{R_iN_c}$	−	·013104

(*b.*) ENGLAND AND WALES.—Deaths from zymotic diarrhœa subtracted.

1871-80—1901-10.

$r_{R_iR_c}$	+	·8923319	$r_{R_iN_c}$	+	·9173291
$r_{R_iE_6}$	−	·9038190	$r_{R_iE_6}$	−	·9038190
$r_{R_cE_6}$	−	·9930991	$r_{N_cE_6}$	−	·9848053
${}_{E_6}r_{R_iR_c}$	−	·10461	${}_{E_6}r_{R_iN_c}$	+	·36661

TABLE III.—*Showing the correlations calculated as in Table I for the decades* 1881-90 *and* 1891-1900. *The English county districts being the units.*

(*a.*) 1881-90:—

$r_{R_iN_c}$	=	+	·8363815	$r_{R_iR_c}$	=	+	·8326501
$r_{R_iE_5}$	=	−	·6768483	$r_{R_iE_5}$	=	−	·6768483
$r_{N_cE_5}$	=	−	·8774573	$r_{R_cE_5}$	=	−	·8724798
${}_{E_5}r_{R_iN_c}$	=	+	·68674	${}_{E_5}r_{R_iR_c}$	=	+	·67309

(*b.*) 1891-1900:—

$r_{R_iN_c}$	=	+	·8796644	$r_{R_iR_c}$	=	+	·8873039
$r_{R_iE_5}$	=	−	·7447911	$r_{R_iE_5}$	=	−	·7447911
$r_{N_cE_5}$	=	−	·8778616	$r_{R_cE_5}$	=	−	·8859062
${}_{E_5}r_{R_iN_c}$	=	+	·70668	${}_{E_5}r_{R_iR_c}$	=	+	·73494

TABLE IV.—*Showing the correlations between the actual death-rates* (A.R.) *and their fourth differences* (F.D.).

Age-period correlated.		England and Wales. All causes. Professor Pearson. 1850-1908.	Measles. 1850-1908.	Whooping cough. 1850-1908.	Zymotic diarrhœa. 1850-1908.	Zymotic diarrhœa. 1850-89.	All causes, less zymotic diarrhœa. 1850-1908.	All causes, less zymotic diarrhœa. 1850-89.	London. All causes. 1850-1908.
0–1 and 1–2	A.R.	+ ·40		+ ·15	− ·16	− ·36	+ ·80	+ ·52	+ ·44
	F.D.	− ·66		− ·67	− ·91	− ·93	− ·22	− ·11	− ·36
1–2 and 2–3	A.R.	+ ·86	− ·16						+ ·88
	F.D.	− ·64	− ·83						− ·73
2–3 and 3–4	A.R.	+ ·92							
	F.D.	− ·62							
3–4 and 4–5	A.R.	+ ·91							
	F.D.	− ·62							

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DISCUSSION ON DR. JOHN BROWNLEE'S PAPER.

DR. W. H. HAMER, in moving a vote of thanks to the author, said that, if he might use a sporting *simile*, the author had played a strong defensive innings, and dealt with very great skill both with the "fast deliveries" from University College and with the "googlies" of Dr. Snow. But he would like to ease his mind by dissenting from him concerning three things: first of all, his first paragraph; secondly, his statement on page 237 that there were three kinds of phthisis, but that was a matter he (the speaker) had dealt with elsewhere, and he would not trouble them with it now; thirdly, with regard to the statement on page 239, he had thought Dr. Brownlee had been convinced by Sir Ronald Ross that exhaustion of susceptibles did play a part in determining periodicity of disease, but apparently Dr. Brownlee was unrepentant. Turning now to Dr. Brownlee's text, Professor Pearson's Paper, he rather wondered why, on page 229, Dr. Brownlee did not comment upon the fact that when Professor Pearson wrote the Paper of 1912 he was dealing with figures of the last century, and with nothing later than 1900; thus, when Professor Pearson thought that the infantile mortality was rising, and that there was, therefore, an inverse relation between infant mortality and mortality at the ages of 1, 2 and 3, the infant mortality had, as a matter of fact, been rapidly falling for twelve years. The delay in the decline was a point which troubled Medical Officers of Health very much twenty years ago, and the late Dr. J. F. J. Sykes had written a Paper of great interest about it; they had all at that time waited and watched for the morning, but it was broad daylight when Professor Pearson wrote his Paper. He thought that the marked decline since 1900 was a point deserving of notice. With regard to the main contention, that "the greater "the infantile death-rate the less is the death-rate among the "survivors," he supposed there was something in that; and he supposed there was also something in the to some extent opposed view, which had been carefully set out by Dr. C. J. Thomas (Dr. Kerr's Annual Report for 1905), that the average heights and weights of children of school age who were born in years of high infant mortality were subnormal, indicating as Dr. Kerr had said, that "the conditions to which five or six of the children born are sacrificed "have a maiming effect upon the other four or five." Neither of these results were obtained without very great labour, statistically speaking, and when obtained they were more or less in conflict with one another. He was reminded of the man who was asked why married men lived longer than single men. The answer was that they did not, it only seemed longer. Both the natural selectionists and Dr. Thomas must be right, and yet when they set about proving their contentions by careful statistical inquiry they could not make very much of it. It was interesting to note that the year in which Professor Pearson was composing Dr. Brownlee's text, was also the year which marks a turning point in his career, for he then began, as he told them all in his Address at York, to venture to regard the reports of Medical Officers of Health as literature. Possibly as a result of this he made two years later the statement "Even in highly organized human communities the death-rate is "selective and physical fitness is the criterion for survival. To "assert the existence of this selection and to measure its intensity "must be distinguished from advocacy of high infantile mortality "as a factor of racial efficiency." So that everyone was now satisfied; they on their part continued to admire the skill with which Professor Pearson obtained his high correlations where heredity was concerned, and Professor Pearson on his part, despite the comparative lowness of the correlations when environment is in question, was content to allow them to go on dealing with slums and ashpits, and generally with abatement of nuisances and overcrowding. As a matter of fact, the war had settled the differences between Professor Pearson and his critics. It was the rank and file that mattered now, and they were all agreed as to the value of the rank and file, for had they not been told that "the men are splendid." No amount of insistence upon high correlations would convince anyone that some of them ought never to have been born. The rank and file were what they were to no insignificant extent on account of the work of those whom Dr. Brownlee had referred to as the "giants of the last century." Dr. Brownlee, of course, was thinking of the men who had struggled to remove adverse environmental conditions, to improve water and food supplies, and to control the spread of epidemic diseases. They all owed a debt of gratitude to Dr. Brownlee for reminding them of the value of their work, and he hoped Dr. Brownlee was right in thinking that as soon as the war was over the older sanitation would again come into its own.

Captain M. Greenwood, Jr., in seconding the vote of thanks, said that he did not intend to discuss the general aspects of the controversy touching the operation of selection within the human race, a controversy which was in some danger of recalling to the mind of the historical student the voluminous literature initiated by a sermon preached almost exactly two hundred years ago and forming the corpus of that "Bangorian Controversy" said to have developed into "an intricate and bewildering mass of side "discussions in which the main issues of the dispute were concealed "almost beyond the possibility of discovery." He did not wish to add to this confusion, and would confine himself to purely technical matters, merely hinting a doubt whether Dr. Brownlee's reference to Miss Beeton and Professor Pearson's Paper on the inheritance of longevity was well adapted to eliminate the personal element from scientific discussion. Dr. Brownlee had criticized severely the method of variate difference correlation, but he (Captain Greenwood) did not think that Dr. Brownlee's discussion of the subject was adequate. With respect to the first criticism, viz., that the correlations of variables free from the time factor were assumed to be zero when the subscripts were unequal, there was no serious difficulty, from the algebraical side, in dropping these restrictions provided the additive time effect could be represented by an nth order parabola. The *practical* difficulty was that the actual statistics could not from the nature of the case provide one with the values of the cross-correlations; but it would evidently be possible, after obtaining the general formula, to investigate the modifications of the final result consequent upon assuming various values for the cross-correlations. This, he thought, should be done. With regard to the much more serious difficulty of periodic factors, he thought that Dr. Brownlee had done less than justice to Miss Elderton and Professor Pearson. These authors were under no illusion as to the importance of the point and definitely expressed their dissent from Dr. Anderson, who had stated that periodic factors could be eliminated by the difference method. Neither did Miss Elderton and Professor Pearson base their conclusion that, in the case with which they dealt, the fallacy was not involved upon a mere inspection of graphs—as Dr. Brownlee's readers might suppose—but upon the sign and magnitude of the correlations at intervals of more than two years. He also thought that Dr. Brownlee's mathematical note was insufficient. All that note provided—taking for simplicity the case of one periodicity—was the correlation between successive terms of a simple Fourier series; the denominator contained the well-known mean square of error functions of such series, and the numerator necessarily took the form shown owing to the evanescence of all cosine product terms not reducible to $\cos\frac{2\pi}{p}$. Professor Pearson might reasonably retort that Dr. Brownlee had only proved what he (Professor Pearson) regarded as a truism, and that what really needed investigation was the case where Dr. Brownlee's M and M' were not constant but variable, and also correlated one with another, while the phases of the periodic time factors were not arbitrarily assumed to be in the relationship given by Dr. Brownlee. He thought that this most interesting problem merited fuller consideration. With respect to Dr. Brownlee's criticism of the processes employed by Dr. Snow and others prior to the introduction of the variate difference method, he questioned whether the substitution for certain measures of others highly correlated therewith was satisfactory. In view of the very high values of the total correlations, small changes in them might lead to large changes in the deduced partial correlations. This, indeed, was one of the dangers of the method, and, although it had not been much commented upon in the earlier publications, Miss Elderton and Professor Pearson had given special attention to it in their recent Paper. Next, as to Dr. Brownlee's objection to the infant death-rate as a mathematical measure. He (Captain Greenwood) saw no reason for supposing that Professor Pearson regarded the infant death-rate, however measured, as something sacrosanct; probably Professor Pearson regarded the measure as a rough one, but thought that no reason why further errors should be introduced by employing a rough and inaccurate method of analysis; hence Professor Pearson made use of what he regarded as the most accurate available process. Dr. Brownlee appeared to wish to have it both ways; he not only denied that Professor Pearson's methods were exact, but he also asserted that the data could not bear exact treatment. He (Captain Greenwood) did not see how data which would lead to correct conclusions when treated roughly must lead to incorrect conclusions when treated accurately. Lastly—and this perhaps was trespassing upon the forbidden field of generality—he did not understand how an epidemic disease which came to an end by the exhaustion of susceptible persons—a method of termination admitted by Dr. Brownlee to be possible—could fail to exercise, in greater or less measure, some selection. He begged to second the vote of thanks to Dr. Brownlee.

Dr. J. C. STAMP said that valuable as the Paper was in relation to the subject at the head of it, it seemed to have a still greater value in what it might lead to in the field of pure statistics. It was what he might call an *experimentum crucis* in the application of a new method. They all knew that when a Chemistry Professor failed in an experiment it was not because the scientific principle he wanted to show was not there to be shown, but that some little error always crept in in his working of it, so that he never achieved the actual result he wanted to achieve. It seemed to him they had something in the nature of a test of the new method of Variate Differences which did not work, and if it led, as he thought it might, in the hands of those able mathematicians who would follow the matter, to a further exploration of this method, it might be the beginning of the setting out of the actual conditions which must be present for that method to be valid. It was very well to experiment on paper with X's and Y's, and arrive at results, and then to pin their attention to any form of vital or other statistics produced by the Registrar-General, and expect that they were going to be as amenable to discipline as the X's and Y's were. Such statistics had a little habit of having a character of their own, and it was only by exploration of experiments that had not worked that one could set out those limiting conditions which were necessary for the full statement of any theoretical question. When the variate difference method was commenced, he thought its first application was to Professor Mortara's statistics of certain Italian industrial and vital statistics, productions of agriculture, and so on. The whole object of the method was then to eliminate a constant time factor, increasing population increasing all classes of products of activities. It seemed to him a very far cry from that to this class of variation where they had admittedly periodicity, but had not a constant rate of growth that they wished to eliminate in order to keep the coefficient of correlation down. This might lead them to find what were the conditions of fallacy and what were the conditions of success. He quite agreed with the remarks of the last speaker, that it did not follow because they applied an exact method to things that were rough they were going to make the situation any worse. It was perfectly true that we wanted to discover what classes of roughness were critical. If there was something behind those figures, as there most evidently was, which caused the extraordinary differences between the negative correlations found in one way and much smaller negatives and positive correlations found by adopting another standard of vital statistics, there must be something behind which would really explain it other than the mere arithmetic change. There must be something in the relationship between the methods of ascertaining the death-rate for England and the mortality rate up to the age of 5—some connection which invalidated that application. So that while he thought their thanks were due to Dr. Brownlee for his application to that subject, he thought perhaps he was building more than he intended to do on this particular thing, in that they might have arise from it acutal contributions to the theory of statistics.

(The vote of thanks was put to the Meeting and carried unanimously.)

Dr. Brownlee, in reply, said he did not want to make many remarks. With regard first to the measures of the death-rate in children, he had been working at this subject on and off for many years without any great success; he quite realized the point of view of those who criticized his statements regarding the measures of the death-rates, and also that the different methods of Dr. Newsholme, Professor Pearson and the Registrar-General might have some definite connection. His point was that by using a definite method of calculation and using the different values of the death-rates, as suggested by the several authorities, quite different results were obtained. It was thus quite clear that a part at least of this difference found must be due to the different methods of measurement. With regard to the criticism of Captain Greenwood that the method might not be wrong and that Dr. Brownlee wished to have it both ways, he submitted that he did wish to have it both ways as he thought the method fallacious. He did not think they could take the expectation at 6 years of age as a constant in a partial correlation coefficient as the variations in the death-rate were organically connected. If the death-rates at different ages in Salford were taken and contrasted with the Healthy District Life-Table death-rates for the same ages, certain relationships were found; if the life-table for London was similarly treated exactly the same kind of relationships at different ages appeared: the difference was in quality not in quantity. These relationships seemed quite definite unless large amounts of epidemic diseases were present at a particular time. With regard to the possibility that the positive correlations arose from the expectation at 5 years of age being taken in place of the expectation at 6 years, he said that was not the case because when Professor Pearson's correlations were re-calculated, taking the expectation at 5 in place of the expectation at 6, it was found that in the former case the value was —·87 as against —·92 in the latter, not a difference of moment. With regard to Captain Greenwood's point as to the selective death-rate caused by an epidemic, selective effect on the death-rate must be much larger on account of the cases of disease than on account of the deaths as epidemic diseases for the most part protect against second attacks. In measles epidemics, for instance, there are on an average at least twenty times the number of cases as deaths. Death from measles further is a matter of the age at which the child takes the disease, the death-rate between 1 and 2 years of age may be as high as 15 per cent., while between 4 and 5 years it is not more than 2 or 3 per cent. The selection, therefore, in epidemic disease cannot be considered as due to the number of deaths but to the number of cases. This selection gives a small correlation coefficient being approximately —·1 in the case of measles, a disease which about a tenth of the number living at the early ages on the average take each year, and this must have a much larger selective effect than any number of deaths. When, however, in this case the Variate Difference method is employed the correlation rises rapidly to —·8. Mr. Trachtenberg has worked out the mathematics of this point and is discussing it in a separate Paper.

The undermentioned Candidates were elected Fellows of the Society :—

Matthew Stevenson Birkett.
Joseph Davies.
Hugh Hastings.
Humfrey Mitchell.

The Correlation Between Death-Rates in Successive Years of Life.

By H. L. Trachtenberg, B.A., A.I.A.

In a paper read to the Royal Statistical Society on February 20, Dr. Brownlee criticised the application of the variate difference method to the problem of estimating the effect an excess of mortality at one year of life has on the mortality in the next or in subsequent years. In the special case discussed he considered the application of the method invalid because a large part of the mortality in childhood is due to infectious diseases, and among these diseases marked periodicities or pseudo-periodicities are found. In addition, as an infectious disease attacks the different age groups at the same time in more or less definite proportions, a high degree of correlation exists between the death-rates at different ages in the same year, rates which the theory requires to be uncorrelated. At the time of writing Dr. Brownlee was of the opinion that the existence of disease periodicities was probably the more important factor in determining the changes in the correlations which are observed when the successive differences are correlated. Before the paper, however, was read it was discovered that the fact that different age groups are attacked in definite proportions by the same epidemic was of more importance than at first thought.

As the matter could only be settled by direct mathematical and arithmetical investigation, an inquiry has been made into the relative effect of the two factors, the results of which are presented below.

In the first place it was important to choose an example in which it was possible to eliminate the time factor due to the continuous fall of the death-rate. The statistics of measles in England and Wales were therefore chosen, as there is no evidence that the death-rate from this very infectious disease has been affected by the environmental and other improvements which have had so marked an influence on the general death-rate. It is true that at the present moment the mortality from measles is lower than in the immediate past, but during the last sixty or seventy years there have been two other periods at which the same phenomenon has been observed.

The method employed in calculating the death-rates has been the same as that used by Miss Elderton and Professor Pearson in their paper in *Biometrika*. The death-rates among males were alone investigated, as the phenomena in both sexes are much the same. The data referred to the years 1850–1908. The coefficients of correlation were calculated first between the death-rates at the ages under one year in the first year, and the death-rates in the second year of age in the year immediately succeeding, both for the figures as they stand and for the second and fourth differences. The same calculations were made for the death-rates in the second and third years of life.

The results were as follows:—

	First and second years of life.	Second and third years of life.
r	$-\cdot03$	$-\cdot16$
r_{Δ^2}	$-\cdot80$	$-\cdot75$
r_{Δ^4}	$-\cdot84$	$-\cdot83$

In a case, therefore, in which there is no time factor the application of the variate difference method produces results in the same range of values as those obtained by Professor Pearson.

Before giving a general investigation it is necessary to determine one or two details. Aberdeen is the only large town in Great Britain in which measles has been a notifiable disease. The statistics for this disease for Aberdeen were published by Dr. George N. Wilson in his paper "Measles: Its Prevalence and Mortality in Aberdeen,"* the data referring to the twenty years 1883–1902. From an examination of these data it was found that there is practically a constant ratio between the numbers infected at each of the early years of life in each epidemic no matter what the size of the epidemic. It is thus permissible to take these ratios as affording a basis of inquiry into the numerical values which such a correlation between the mortalities or rate of infection in adjacent years of life in the same year of time introduces into the corresponding correlation for successive years of time when the method of variate differences is used. The ratio obtained between the numbers infected in the second year of life and those in the first year is approximately 1·7, while the number of cases in the second and third year of life are practically equal.

It is now possible to develop a mathematical theory.

Consider first a very simple case. (1) Let a disease attack at intervals the members of a population which in the first and second years of life is stationary, the number of births being constant, and subject on the average of a number of years to a constant death-rate: (2) let further the amount of disease in any year vary in a purely random manner: (3) assume that no immunity is conferred by one attack of the disease. This corresponds to the idea that healthy and unhealthy years may exist, an idea as old as Hippocrates, and an undoubted fact. It is clear from what has been said that the number of cases arising in one year of life may be derived from the number in the adjacent year of life in any epidemic by multiplying by a constant defining the ratio in which the age groups are affected by the same epidemic. If then a_t be the number of cases arising in one year of life, the subscript t referring to the date at which the epidemic takes place, sa_t will be the number arising in the next year of life, s being a constant obtained from the statistics. Thus, there is perfect correlation between the number of cases at each age in the same year, though the size of the epidemic in each of a series of years is purely random. The correlation between the number of cases and deaths at one age period in one year and the next age period in the succeeding year can now be calculated. The correlation will be between the successive pairs:—

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* Public Health, November, 1905.

$$\begin{array}{ll} a_1 & sa_2 \\ a_2 & sa_3 \\ \vdots & \vdots \end{array}$$

These numbers a_t and sa_{t+1} are quite uncorrelated since the a's arise in a random fashion. The correlation is therefore zero. This value obviously does not obtain when the correlation is calculated between the successive differences. The first differences are of the form $a_{t+1} - a_t$ and $s(a_{t+2} - a_{t+1})$. A common portion, a_{t+1}, is thus introduced into the two terms. As this portion is in the one term positive and in the other negative a negative correlation obviously results, and it is found that the coefficient of correlation is as high as $-\cdot 5$.

Taking the general case, the *nth* differences of the terms are of the form

$$a_{t+n} - {}^nC_1 a_{t+n-1} + {}^nC_2 a_{t+n-2} - \dots\dots\dots + (-1)^n a_t$$

and $s\{a_{t+n+1} - {}^nC_1 a_{t+n} + {}^nC_2 a_{t+n-1} - \dots\dots + (-1)^n a_{t+1}\}$ into which a whole series of variables $a_{t+n}, a_{t+n-1}, \dots\dots a_{t+1}$, n in number, enter with opposite sign. Though the weighting is not the same in each case, the common portion is found to have a continuously increasing effect on the correlation coefficient, which between the *nth* differences is found to be $-\frac{n}{n+1}$. For $n = 2$ and for $n = 4$ the values of the coefficient are thus respectively $-\cdot 67$

and $-\cdot 80$. Comparing these values with the actual values given by the statistics it is seen that values of the same range and character as those found must follow if epidemics striking adjacent ages in the same years come merely at random. The comparison is between $-\cdot 03$, $-\cdot 80$, $-\cdot 84$, figures derived from the statistics, and $\cdot 00$, $-\cdot 67$ and $-\cdot 80$ derived on the hypothesis advanced.

A further inquiry in this part of the subject is possible. In the case treated by Professor Pearson the death-rates from all causes were correlated. In addition to infectious diseases which attack the different age groups at the same time in more or less definite proportions, there is a large proportion of other diseases, such as diseases of the lungs, which deviate little from this principle. It must be determined whether these factors are sufficient to produce important numerical effect. This has been done by calculating the correlation between the death-rates in the second and third years of life for the same year. Between the rates themselves the correlation is $+\cdot 927$. This figure, however, is too high, owing to the time factor which enters into both sets of figures. Between the fourth differences the correlation is $+\cdot 759$.* This may be taken as measuring the degree of correlation between the rates in the two age groups in the same year, assuming, though the assumption is doubtful, that with the fourth differences the time factor has been eliminated. Since the correlation between the number at each age group is therefore no longer unity but a smaller number, r, the formula already given requires extension. Assuming that the annual number of cases is still random, the correlation coefficient between the terms themselves is still zero, but that between the *nth* differences changes from $-\frac{n}{n+1}$ to $-\frac{n}{n+1}r$.

Hence the correlation coefficient between the fourth differences of the death-rates in the second and third years of life takes the value $-\cdot 80 \times \cdot 759$ or $-\cdot 607$. The value found by Professor Pearson is $-\cdot 636$. Thus a correlation coefficient comparable with that found from the statistics arises directly from the process of differencing on the very simple hypothesis of the random occurrence of disease attacking adjacent age groups in a highly correlated manner, having no relation to the time factor.

Equally significant results are obtained in the case of London. The correlation between the fourth differences of the death-rates from all causes in the first and second years of life in successive years, in 1850–1908, is – ·36, and in the second and third years of life – ·73. According to the theory advanced above, these numbers should agree with the product of the corresponding coefficients of correlation between the death-rates in the same years and the factor – ·80. These coefficients have been calculated. For the fourth differences they take the values + ·496 and + ·928 respectively. The theory thus gives – ·80 × ·496 or – ·40, and – ·80 × ·928 or – ·74, figures in very close correspondence with the actual results shown above.

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* There is a further correlation due to successive healthy or successive unhealthy years which would help to bring the figure down from the value $\cdot 9$.

The question of the effect of immunity conferred by one attack of a disease, on the value of the correlation coefficient may now be considered. Let M be the number of susceptible persons in one year of life, a_t the number who take the disease, k the proportion of the M susceptible persons who survive to the succeeding year.

Then although the rate of attack in the second year may be approximately taken as still proportional to the number of cases sa_t without allowance for immunity, the number of susceptible persons to which this rate must be applied to give the cases is not $k\mathrm{M}$ but $k\,(\mathrm{M} - a_t)$. It follows that the number of cases in the second year of life is $k\,(\mathrm{M} - a_t).\,\frac{sa_{t+1}}{k\mathrm{M}}$, so that we have to correlate a_t and $\frac{s}{\mathrm{M}}\,(\mathrm{M} - a_t)\,a_{t+1}$. It will thus be observed that by the introduction of the question of immunity a common variable portion a_t with opposite sign appears in the terms correlated, so that negative correlation is introduced.

The amount is small, however, the formula in this case being

$$r = -\frac{\frac{\bar{a}}{\mathrm{M}}}{\sqrt{\left(1-\frac{\bar{a}}{\mathrm{M}}\right)^2+\left(\frac{\bar{a}}{\mathrm{M}}\right)^2+\left(\frac{\sigma_a}{\mathrm{M}}\right)^2}}$$

where $\bar{a}$ is the mean of the number of cases in the first of the two age groups and σ_a their standard deviation, both of which are small as a rule compared with M.

In the same way little change is made in the coefficient of correlation between the differences, the formula for the *nth* differences being

$$r_{\Delta^n} = -\frac{n+\frac{\bar{a}}{\mathrm{M}}}{\sqrt{(n+1)\left[(n+1)\left\{\left(1-\frac{\bar{a}}{\mathrm{M}}\right)^2+\left(\frac{\bar{a}}{\mathrm{M}}\right)^2+\left(\frac{\sigma_a}{\mathrm{M}}\right)^2\right\}+2n\left(1-\frac{\bar{a}}{\mathrm{M}}\right)\frac{\bar{a}}{\mathrm{M}}\right]}}$$

An approximate value for $\frac{\bar{a}}{M}$ was obtained from the fact that about 10 per cent. of the children in the second year of life are attacked by measles in that year. Since the number of cases in the second year of life is $s\bar{a}$ and the number living kM, we therefore have $\frac{s\bar{a}}{kM} = \cdot 1$. But $s = 1\cdot 7$ and $k = \cdot 84$.* Therefore $\frac{\bar{a}}{M} = .05$.

To obtain $\frac{\sigma_a}{M}$ it was assumed as a very rough approximation that the proportion of deaths to cases was the same from year to year. The standard deviation of the cases on this assumption, bears the same ratio to the mean ($\cdot 05M$) as obtains for the deaths. The value $\cdot 02$ was thus obtained for $\frac{\sigma_a}{M}$.

The results obtained by using the values for $\frac{\bar{a}}{M}$ and $\frac{\sigma_a}{M}$ in the above formulæ, were

$$r = -\cdot 05$$
$$r_{\Delta^2} = -\cdot 69$$
$$r_{\Delta^4} = -\cdot 82$$

which show little change from the values found without allowance for immunity.

The coefficients of correlation for the second and third years of life are similarly obtained. The mean and standard deviation of the case distribution, and the population of the first year of the pair enter into the formulæ in exactly the same manner as in the case just treated. The mean of the first of the pair being s times the mean of the cases in the first year of life is $s\bar{a}$ and in the same way the standard deviation being s times the standard deviation in the first year of life is $s\sigma_a$, while the population is kM. Thus the formulæ become

$$r = -\frac{\frac{s\bar{a}}{kM}}{\sqrt{\left(1-\frac{s\bar{a}}{kM}\right)^2 + \left(\frac{s\bar{a}}{kM}\right)^2 + \left(\frac{s\sigma_a}{kM}\right)^2}},$$

$$r_{\Delta^n} = -\frac{n + \frac{s\bar{a}}{kM}}{\sqrt{(n+1)\left[(n+1)\left\{\left(1-\frac{s\bar{a}}{kM}\right)^2 + \left(\frac{s\bar{a}}{kM}\right)^2 + \left(\frac{s\sigma_a}{kM}\right)^2\right\} + 2n\left(1-\frac{s\bar{a}}{kM}\right)\frac{s\bar{a}}{kM}\right]}}$$

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* Estimated approximately by taking the mean of the values given by the last four life-tables 1871–80, 1881–90, 1891–1900 and 1901–10. If that for 1838–54 be included the figure is unaltered.

The values obtained are :—

$$r\ \ =-\cdot 11$$
$$r_{\Delta^2}=-\cdot 72$$
$$r_{\Delta^4}=-\cdot 83$$

which are somewhat closer to the actual figures $-\cdot 16$, $-\cdot 75$ and $-\cdot 83$ than when no allowance was made for immunity.

Extending the subject a little an allowance for the progressive development of immunity may be made. Employing the same method and notation, the number of cases in the third year of life may be expressed as $k'\left\{k(\mathrm{M}-a_t)\left(1-\frac{sa_{t+1}}{k\mathrm{M}}\right)\right\}\frac{s'a_{t+2}}{k'k\mathrm{M}}$ where k' is the factor of survival between the second and third year of age and s' the ratio of the number of cases which occur in the two age groups. Omitting constant multipliers, terms to be correlated are $(\mathrm{M}-a_t)a_{t+1}$ and $(\mathrm{M}-a_t)\ (k\mathrm{M}-sa_{t+1})\ a_{t+2}$.

The formulæ for this case are

$$r=-\frac{\left\{\left(1-\frac{\bar{a}}{\mathrm{M}}\right)^2+\left(\frac{\sigma_a}{\mathrm{M}}\right)^2\right\}\frac{s\bar{a}}{k\mathrm{M}}-\left(1-\frac{s\bar{a}}{k\mathrm{M}}\right)\left(\frac{\bar{a}}{\mathrm{M}}\right)^2}{\sqrt{\begin{array}{r}\left\{\left(1-\frac{\bar{a}}{\mathrm{M}}\right)^2+\left(\frac{\bar{a}}{\mathrm{M}}\right)^2+\left(\frac{\sigma_a}{\mathrm{M}}\right)^2\right\}\left[\left(1-\frac{\bar{a}}{\mathrm{M}}\right)^2\left(1-\frac{s\bar{a}}{k\mathrm{M}}\right)^2+\left\{\left(\frac{\bar{a}}{\mathrm{M}}\right)^2+\left(\frac{\sigma_a}{\mathrm{M}}\right)^2\right\}\times\right.\\ \left.\left\{\frac{s^2}{k^2}\left(1-\frac{\bar{a}}{\mathrm{M}}\right)^2+\left(\frac{\sigma_a}{\mathrm{M}}\right)^2+\left(1-\frac{s\bar{a}}{k\mathrm{M}}\right)^2\right\}\right]\end{array}}},$$

$$r_{\Delta^n}=-\frac{\begin{array}{l}(n+1)(n+2)\left[\left\{\left(1-\frac{\bar{a}}{\mathrm{M}}\right)^2+\left(\frac{\sigma_a}{\mathrm{M}}\right)^2\right\}\frac{s\bar{a}}{k\mathrm{M}}-\left(1-\frac{s\bar{a}}{k\mathrm{M}}\right)\left(\frac{\bar{a}}{\mathrm{M}}\right)^2\right]\\ +n(n+2)\left(1-\frac{\bar{a}}{\mathrm{M}}\right)\left[\left(1-\frac{\bar{a}}{\mathrm{M}}\right)\left(1-\frac{s\bar{a}}{k\mathrm{M}}\right)-\left(1-\frac{s\bar{a}}{k\mathrm{M}}\right)\frac{\bar{a}}{\mathrm{M}}+\frac{s}{k}\left\{\left(\frac{\bar{a}}{\mathrm{M}}\right)^2+\left(\frac{\sigma_a}{\mathrm{M}}\right)^2\right\}\right]\\ +n(n-1)\frac{\bar{a}}{\mathrm{M}}\left(1-\frac{\bar{a}}{\mathrm{M}}\right)\left(1-\frac{s\bar{a}}{k\mathrm{M}}\right)\end{array}}{\sqrt{\begin{array}{l}\left[(n+1)\,(n+2)\left\{\left(1-\frac{\bar{a}}{\mathrm{M}}\right)^2+\left(\frac{\bar{a}}{\mathrm{M}}\right)^2+\left(\frac{\sigma_a}{\mathrm{M}}\right)^2\right\}+2n(n+2)\left(1-\frac{\bar{a}}{\mathrm{M}}\right)\frac{\bar{a}}{\mathrm{M}}\right]\times\\ \left[(n+1)(n+2)\left\{\left(1-\frac{\bar{a}}{\mathrm{M}}\right)^2\left(1-\frac{s\bar{a}}{k\mathrm{M}}\right)^2+\left\{\left(\frac{\bar{a}}{\mathrm{M}}\right)^2+\left(\frac{\sigma_a}{\mathrm{M}}\right)^2\right\}\left\{\frac{s^2}{k^2}\left(1-\frac{\bar{a}}{\mathrm{M}}\right)^2+\left(\frac{\sigma_a}{\mathrm{M}}\right)^2\right.\right.\right.\\ \left.\left.+\left(1-\frac{s\bar{a}}{k\mathrm{M}}\right)^2\right\}\ +2n(n+2)\frac{s\bar{a}}{k\mathrm{M}}\left(1-\frac{\bar{a}}{\mathrm{M}}\right)\left\{\left(1-\frac{\bar{a}}{\mathrm{M}}\right)\left(1-\frac{s\bar{a}}{k\mathrm{M}}\right)-\left(1-\frac{s\bar{a}}{k\mathrm{M}}\right)\frac{\bar{a}}{\mathrm{M}}\right.\\ \left.\left.+\frac{s}{k}\left(\frac{\sigma_a}{\mathrm{M}}\right)^2\right\}-2n(n-1)\frac{\bar{a}}{\mathrm{M}}\left(1-\frac{\bar{a}}{\mathrm{M}}\right)\left(1-\frac{s\bar{a}}{k\mathrm{M}}\right)^2\right]\end{array}}}$$

The results are

$$r = -\cdot 11$$
$$r_{\Delta^2} = -\cdot 68$$
$$r_{\Delta^4} = -\cdot 80$$

A consideration of all the results allowing for the effect of immunity shows that while it supplies a small negative correlation for the terms themselves which seems to be reflected in the actual figures, its effect on the differences is very small.

It is now necessary to discuss a modification required in the case of a disease like whooping cough, in which the annual epidemic is not, like measles, confined within the limits of the calendar year.

On the hypothesis of the random size of epidemics, the figures relating to any calendar year include in such a case portions of two adjacent epidemics.

Suppose that the random epidemic ending in the calendar year t to $t + 1$ is denoted by a_t and assume c and c' the proportions of the old and new epidemics coming within that year to be the same from year to year.

Then the number of cases in the calendar year t to $t + 1$ is $ca_t + c'a_{t+1}$ while the number in the calendar year $t + 1$ to $t + 2$ is $ca_{t+1} + c'a_{t+2}$. It follows that even although the sizes of the separate epidemics $a_1, a_2, a_3, \ldots.$ are random, yet the annual numbers of cases per calendar year are not, since $ca_t + c'a_{t+1}$, $ca_{t+1} + c'a_{t+2}$ the cases occurring in consecutive calendar years have a common portion a_{t+1}. As will be shown this has a considerable effect on the correlation between the death-rates in adjacent years of life in successive years, which is greatest when $c = c'$, *i.e.*, the annual epidemic is equally distributed in the two adjacent calendar years.

It is possible to determine rough values for c and c' in the case of whooping cough. In Dr. Brownlee's paper on the periodicity of infectious diseases, in the issue of "Public Health" for March, 1915 (Investigations into the Periodicity of Infectious Diseases by the Application of a Method hitherto only used in Physics), are given the decennial average numbers of deaths from whooping cough in London in each lunar month for the period 1840–1909. In each decade the average annual figures show a clear line of demarcation between the old epidemic ending and the new one beginning For instance, in 1850–59 the old epidemic terminated and the new one started in the ninth or tenth lunar month, while in 1900–1909 the dividing point was as late as the eleventh or twelfth. Rough average values of c and c' were obtained by summing the figures for 1850–1909 from the commencement of the calendar year to the dividing point (proportion c) and those from the dividing point to the end of the calendar year (proportion c') In this way it was found that $c = \cdot 83$, $c' = \cdot 17$.

The change in the formula $-\frac{n}{n+1}$ due to the new phenomenon may now be given. Suppose that for the first year of life the total number of cases in the epidemic which ends in the year t to $t+1$ is a_t then the number of cases in that year, counting both old and new epidemics, is $ca_t + c'a_{t+1}$, where c and c' are the proportions already defined. It follows that for the year $t+1$ to $t+2$ the number of cases is $ca_{t+1} + c'a_{t+2}$, and that since cases in the second year of life bear a definite proportion s to those in the first year of life, therefore the number of cases in the year $t+1$ to $t+2$ in the second year of life is $s\,(ca_{t+1} + c'a_{t+2})$.

We have, therefore, to correlate $ca_t + c'a_{t+1}$ and $s\,(ca_{t+1} + c'a_{t+2})$. In the case of measles either c or c' is absent, giving a zero correlation, but so long as neither c nor c' is zero, there is a positive correlation given by the formula $r = \frac{cc'}{1 - 2cc'}$, while the correlation between the *nth* differences is no longer $-\frac{n}{n+1}$ but

$$r_{\Delta^n} = -\frac{n\,(n+2)\,(1-2\,cc') - 2\,(n^2+n+1)\,cc'}{(n+1)\,(n+2)\,(1-2\,cc') - 2n\,(n+2)\,cc'}.$$

In these formulæ $c + c' = 1$.

Putting in the values of c and c' just found for whooping cough we find $r = + \cdot 20$

and $r_{\Delta^4} = - \cdot 77$,

as compared with the actual figures of $+ \cdot 15$ and $- \cdot 66$.

When immunity is allowed for, then on the same lines as in the case of measles we have to correlate $ca_t + c'a_{t+1}$ and $k\,\{\mathrm{M} - (ca_t + c'a_{t+1})\}\,\frac{s.(ca_{t+1} + c'a_{t+2})}{k\mathrm{M}}$. The formulæ in this case are

$$r = \frac{cc'\left(\frac{\sigma_a}{\mathrm{M}}\right)^2 - (1-cc')\left(\frac{\bar{a}}{\mathrm{M}}\right)\left(\frac{\sigma_a}{\mathrm{M}}\right)^2 - cc'^2\left(\frac{\mu_3}{\mathrm{M}^3}\right)}{\sqrt{\begin{bmatrix}(1-2\,cc')\left(\frac{\sigma_a}{\mathrm{M}}\right)^2 \Big[(1-2\,cc')\left(\frac{\sigma_a}{\mathrm{M}}\right)^2 - 2\,(1-cc')\left(\frac{\bar{a}}{\mathrm{M}}\right)\left(\frac{\sigma_a}{\mathrm{M}}\right)^2 - 2c^2c'\frac{\mu_3}{\mathrm{M}^3} \\ +2\,(1-cc')\left(\frac{\bar{a}}{\mathrm{M}}\right)^2\left(\frac{\sigma_a}{\mathrm{M}}\right)^2 + (1-4\,cc' + 2\,c^2c'^2)\left(\frac{\sigma_a}{\mathrm{M}}\right)^4 + 2\,cc'\left(\frac{\bar{a}}{\mathrm{M}}\right)\frac{\mu_3}{\mathrm{M}^3} + c^2c'^2\frac{\mu_4}{\mathrm{M}^4}\Big]\end{bmatrix}}},$$

$$r_{\Delta^n} = \frac{\begin{array}{l}(n+2)(n+1)\left\{cc'\left(\frac{\sigma_a}{\mathrm{M}}\right)^2-(1-cc')\left(\frac{\bar{a}}{\mathrm{M}}\right)\left(\frac{\sigma_a}{\mathrm{M}}\right)^2-cc'^2\frac{\mu_3}{\mathrm{M}^3}\right\}\\ -(n+2)n\left\{(1-2cc')\left(\frac{\sigma_a}{\mathrm{M}}\right)^2-\left(\frac{\bar{a}}{\mathrm{M}}\right)\left(\frac{\sigma_a}{\mathrm{M}}\right)^2-c^2c'\frac{\mu_3}{\mathrm{M}^3}\right\}+n(n-1)\,cc'\left(\frac{\sigma_a}{\mathrm{M}}\right)^2\left\{1-\frac{\bar{a}}{\mathrm{M}}\right\}\end{array}}{\sqrt{\begin{array}{l}\left[(n+2)\,(n+1)\,(1-2\,cc')\left(\frac{\sigma_a}{\mathrm{M}}\right)^2-2\,(n+2)\,n\,cc'\left(\frac{\sigma_a}{\mathrm{M}}\right)^2\right]\times\\ \left[\begin{array}{l}(n+2)\,(n+1)\left\{(1-2\,cc')\left(\frac{\sigma_a}{\mathrm{M}}\right)^2-2\,(1-cc')\,\frac{\bar{a}}{\mathrm{M}}\left(\frac{\sigma_a}{\mathrm{M}}\right)^2-2c^2c'\frac{\mu_3}{\mathrm{M}^3}\right.\\ \quad\left.+2(1-cc')\left(\frac{\bar{a}}{\mathrm{M}}\right)^2\left(\frac{\sigma_a}{\mathrm{M}}\right)^2+(1-4cc'+2c^2c'^2)\left(\frac{\sigma_a}{\mathrm{M}}\right)^4+2cc'\left(\frac{\bar{a}}{\mathrm{M}}\right)\frac{\mu_3}{\mathrm{M}^3}+c^2c'^2\frac{\mu_4}{\mathrm{M}^4}\right\}\\ -2(n+2)n\left\{cc'\left(\frac{\sigma_a}{\mathrm{M}}\right)^2-\left(\frac{\bar{a}}{\mathrm{M}}\right)\left(\frac{\sigma_a}{\mathrm{M}}\right)^2-cc'^2\frac{\mu_3}{\mathrm{M}^3}+\left(\frac{\bar{a}}{\mathrm{M}}\right)^2\left(\frac{\sigma_a}{\mathrm{M}}\right)^2+c^2c'^2\left(\frac{\sigma_a}{\mathrm{M}}\right)^4\right.\\ \qquad\qquad\left.+cc'\,\frac{\bar{a}}{\mathrm{M}}\,\frac{\mu_3}{\mathrm{M}^3}\right\}-2n\,(n-1)\left\{cc'\,\frac{\bar{a}}{\mathrm{M}}\left(\frac{\sigma_a}{\mathrm{M}}\right)^2\left(1-\frac{\bar{a}}{\mathrm{M}}\right)\right\}\end{array}\right]\end{array}}}$$

where μ_3 and μ_4 are the third and fourth moments of the case distribution in the first year of life. It is useless to calculate these moments with the aid of the deaths, as in measles, since owing to the presence of the time factor they would give fallacious results for the purpose of the correlation. If it be assumed that when the time factor is removed the distribution of a is normal, then $\mu_3=0$ $\mu_4=3\sigma_a{}^4$ and the formulæ become

$$r = \frac{cc'-(1-cc')\frac{\bar{a}}{\mathrm{M}}}{\sqrt{(1-2cc')\left[(1-2cc')-2(1-cc')\frac{\bar{a}}{\mathrm{M}}\left(1-\frac{\bar{a}}{\mathrm{M}}\right)+(1-4cc'+5c^2c'^2)\left(\frac{\sigma_a}{\mathrm{M}}\right)^2\right]}},$$

$$r_{\Delta^n} = \frac{(n+2)(n+1)\left\{cc'-(1-cc')\frac{\bar{a}}{\mathrm{M}}\right\}-(n+2)n\left\{(1-2cc')-\frac{\bar{a}}{\mathrm{M}}\right\}+n(n-1)cc'\left(1-\frac{\bar{a}}{\mathrm{M}}\right)}{\sqrt{\begin{array}{l}\left[(n+2)\,(n+1)\,(1-2cc')-2\,(n+2)\,ncc'\right]\times\\ \left[\begin{array}{l}(n+2)(n+1)\left\{(1-2cc')-2(1-cc')\frac{\bar{a}}{\mathrm{M}}\left(1-\frac{\bar{a}}{\mathrm{M}}\right)+(1-4cc'+5c^2c'^2)\left(\frac{\sigma_a}{\mathrm{M}}\right)^2\right\}\\ -2(n+2)n\left\{cc'-\left(\frac{\bar{a}}{\mathrm{M}}\right)\left(1-\frac{\bar{a}}{\mathrm{M}}\right)+c^2c'^2\left(\frac{\sigma_a}{\mathrm{M}}\right)^2\right\}\\ -2n(n-1)\left\{cc'\frac{\bar{a}}{\mathrm{M}}\left(1-\frac{\bar{a}}{\mathrm{M}}\right)\right\}\end{array}\right]\end{array}}}$$

In the case of whooping cough $\frac{\bar{a}}{\mathrm{M}}$, the average rate of attack in the first year of life, is about 5 per cent.

The order of $\frac{\sigma_a}{M}$ would be that of $\frac{\bar{a}}{M}$, but it is difficult to estimate its value. If it be left out of account, the formulæ give the results

$$r = +\cdot15$$
$$r_{\Delta^4} = -\cdot79$$

Thus little change has occurred in the coefficient for the fourth differences, which is still close to the actual figure $-\cdot66$, but the correlation between the terms themselves has been brought down to the actual figure of $+\cdot15$. The difficulty of the presence of the time factor, however, makes this last result less open to final judgment than would otherwise be the case.

Having thus investigated the influence which the presence of healthy and unhealthy years occurring at random have upon the correlation coefficients found by the variate difference method, it is necessary to further investigate whether there is any notable difference produced when the diseases occur at more or less regular intervals. This is a well recognized phenomenon. The simplest case is to assume that a sine curve may be taken to represent the variations. This if, of course, only a rough approximation, but will serve to show the alteration in value of the correlation coefficient which the presence of this factor may be expected to introduce.

On this hypothesis the rate at which new cases are arising at time t is assumed to be $a + m' cos\left(\frac{2\pi t}{p} + \epsilon'\right)$ where a is the mean rate, m' the amplitude or maximum fluctuation, p the period and ϵ' the phase, a constant defining with a and m' the initial rate, $a + m' cos\ \epsilon'$, and indicating by the positive or negative sign of $sin\ \epsilon'$ whether this initial rate is about to decrease or about to increase. If, therefore, t be measured in years, the number of cases in the year t to $t + 1$ is, on integration, $a + m\ cos\left(\frac{2\pi t}{p} + \epsilon\right)$ where $m = \frac{m' sin \frac{\pi}{p}}{\frac{\pi}{p}}$ and $\epsilon = \epsilon' + \frac{\pi}{p}$.

It follows that the number of cases in the second year of life in the year $t + 1$ to $t + 2$ is $s\left[a + m\ cos\left(\frac{2\pi\ t+1}{p} + \epsilon\right)\right]$, where s is the constant already defined.

Assuming that p is greater than unity and that the number of years included contains p an integral number of times, the correlation between these terms is $cos \frac{2\pi}{p}$. Only a slight error will be introduced, however, if a small proportion of terms more or less than a multiple is taken. The same formula $\cos\frac{2\pi}{p}$ holds for the correlation between the differences, whatever their degree. There is one exception to these results, viz., when $p = 2$ and the rate at which cases are being formed is at its maximum or minimum initially, *i.e.*, ϵ' is a multiple of π, making ϵ an odd multiple of $\frac{\pi}{2}$. In this case the terms to be correlated become the constants a and sa.

As an example the figures for London have been chosen, as the epidemics of measles in that city show a marked period of $1\frac{7}{8}$ years.

The values of the correlation coefficients found for the statistics referring to the second and third years of life are as follows:—

$$r = -\cdot 32$$
$$r_{\Delta^2} = -\cdot 90$$
$$r_{\Delta^4} = -\cdot 88$$

Assuming that the form of the epidemic can be expressed by a simple sine curve the theoretical values of the correlation coefficients would be $\cos\left(\frac{360}{1\frac{7}{8}}\right)^{\circ}$, or $-\cdot 98$.

As will be indicated in the formulæ about to be given, in which the presence of more than one period of over a year, or other modifications in the hypothesis are treated the contributions of the constituent periodic terms to the correlation coefficient are in general dependent on the amplitude of the annual cases as well as the period. It will be also seen that a special form is assumed in the case of one of the periods p_1 being two units, in the present instance years. In this case the contribution depends in general not only on the period and maximum fluctuation but the phase ϵ_1 associated with the period of two years.

When more than one period is present, for instance, two periods p_1 and p_2, then if p_1 and p_2 are unequal and each is greater than unity, the formulæ are:—

$$r = \frac{m_1^2 \cos\frac{2\pi}{p_1} + m_2^2 \cos\frac{2\pi}{p_2}}{m_1^2 + m_2^2}$$

$$\text{and } r_{\Delta^n} = \frac{m_1^2 \sin^{2n}\frac{\pi}{p_1}\cos\frac{2\pi}{p_1} + m_2^2 \sin^{2n}\frac{\pi}{p_2}\cos\frac{2\pi}{p_2}}{m_1^2 \sin^{2n}\frac{\pi}{p_1} + m_2^2 \sin^{2n}\frac{\pi}{p_2}}$$

unless either p_1 or $p_2 = 2$, or $\frac{1}{p_1} + \frac{1}{p_2} = 1$.

If $p_1 = 2$ the formulæ are

$$r = \frac{-2m_1^2\cos^2\epsilon_1 + m_2^2\cos\frac{2\pi}{p_2}}{2m_1^2\cos^2\epsilon_1 + m_2^2}$$

$$r_{\Delta^n} = \frac{-2m_1^2\cos^2\epsilon_1 + m_2^2\sin^{2n}\frac{\pi}{p_2}\cos\frac{2\pi}{p_2}}{2m_1^2\cos^2\epsilon_1 + m_2^2\sin^{2n}\frac{\pi}{p_2}}$$

If $\frac{1}{p_1} + \frac{1}{p_2} = 1$, *e.g.* $p_1 = 1\frac{1}{2}$, $p_2 = 3$,

$$r = \frac{m_1^2\cos\frac{2\pi}{p_1} - 2m_1m_2\cos(\epsilon_1+\epsilon_2)\cos\left(\frac{1}{p_1} - \frac{1}{p_2}\right)\pi + m_2^2\cos\frac{2\pi}{p_2}}{m_1^2 + 2m_1m_2\cos(\epsilon_1+\epsilon_2) + m_2^2},$$

$$r_{\Delta^n} = \frac{m_1^2\sin^{2n}\frac{\pi}{p_1}\cos\frac{2\pi}{p_1} - 2m_1m_2\cos(\epsilon_1+\epsilon_2)\sin^n\frac{\pi}{p_1}\sin^n\frac{\pi}{p_2}\cos\left(\frac{1}{p_1} - \frac{1}{p_2}\right)\pi + m_2^2\sin^{2n}\frac{\pi}{p_2}\cos\frac{2\pi}{p_2}}{m_1^2\sin^{2n}\frac{\pi}{p_1} + 2m_1m_2\cos(\epsilon_1+\epsilon_2)\sin^n\frac{\pi}{p_1}\sin^n\frac{\pi}{p_2} + m_2^2\sin^{2n}\frac{\pi}{p_2}}$$

If the periods refer to different diseases, the definite proportions s_1, and s_2 in which they affect the two age groups will not in general be the same. The formulæ in this case are

$$r = \frac{s_1m_1^2\cos\frac{2\pi}{p_1} + s_2m_2^2\cos\frac{2\pi}{p_2}}{\sqrt{(m_1^2 + m_2^2)(s_1^2m_1^2 + s_2^2m_2^2)}}$$

and $$r_{\Delta^n} = \frac{s_1m_1^2\sin^{2n}\frac{\pi}{p_1}\cos\frac{2\pi}{p_1} + s_2m_2^2\sin^{2n}\frac{\pi}{p_2}\cos\frac{2\pi}{p_2}}{\sqrt{\left(m_1^2\sin^{2n}\frac{\pi}{p_1} + m_2^2\sin^{2n}\frac{\pi}{p_2}\right)\left(s_1^2m_1^2\sin^{2n}\frac{\pi}{p_1} + s_2^2m_2^2\sin^{2n}\frac{\pi}{p_2}\right)}}$$

when neither p_1 nor p_2 is 2, nor $\frac{1}{p_1} + \frac{1}{p_2} = 1$.

If $p_1 = 2$,

$$r = \frac{-2s_1m_1^2\cos^2\epsilon_1 + s_2m_2^2\cos\frac{2\pi}{p_2}}{\sqrt{(2m_1^2\cos^2\epsilon_1 + m_2^2)(2s_1^2m_1^2\cos^2\epsilon_1 + s_2^2m_2^2)}},$$

$$r_{\Delta^n} = \frac{-2s_1m_1^2\cos^2\epsilon_1 + s_2m_2^2\sin^{2n}\frac{\pi}{p_2}\cos\frac{2\pi}{p_2}}{\sqrt{\left(2m_1^2\cos^2\epsilon_1 + m_2^2\sin^{2n}\frac{\pi}{p_2}\right)\left(2s_1^2m_1^2\cos^2\epsilon_1 + s_2^2m_2^2\sin^{2n}\frac{\pi}{p_2}\right)}}.$$

If $\frac{1}{p_1}+\frac{1}{p_2}=1$,

$$r=\frac{s_1m_1^2\cos\frac{2\pi}{p_1}+m_1m_2\left\{s_1\cos\left(\frac{2\pi}{p_1}+\epsilon_1+\epsilon_2\right)+s_2\cos\left(\frac{2\pi}{p_2}+\epsilon_1+\epsilon_2\right)\right\}+s_2m_2^2\cos\frac{2\pi}{p_2}}{\sqrt{(m_1^2+2\,m_1m_2\cos(\epsilon_1+\epsilon_2)+m_2^2)(s_1^2\,m_1^2+2s_1s_2m_1m_2\cos(\epsilon_1+\epsilon_2)+s_2^2m_2^2)}}$$

$$r_{\Delta^n}=\frac{s_1m_1^2\sin^{2n}\frac{\pi}{p_1}\cos\frac{2\pi}{p_1}+m_1m_2\sin^n\frac{\pi}{p_1}\sin^n\frac{\pi}{p_2}\left\{s_1\cos\left(\frac{2\pi}{p_1}+\epsilon_1+\epsilon_2\right)+s_2\cos\left(\frac{2\pi}{p_2}+\epsilon_1+\epsilon_2\right)\right\}+s_2m_2^2\sin^{2n}\frac{\pi}{p_2}\cos\frac{2\pi}{p_2}}{\sqrt{\left[\begin{array}{l}\left(m_1^2\sin^{2n}\frac{\pi}{p_1}+2m_1m_2\cos(\epsilon_1+\epsilon_2)\sin^n\frac{\pi}{p_1}\sin^n\frac{\pi}{p_2}+m_2^2\sin^{2n}\frac{\pi}{p_2}\right)\\ \times\left(s_1^2m_1^2\sin^{2n}\frac{\pi}{p_1}+2s_1s_2m_1m_2\cos(\epsilon_1+\epsilon_2)\sin^n\frac{\pi}{p_1}\sin^n\frac{\pi}{p_2}+s_2^2m_2^2\sin^{2n}\frac{\pi}{p_2}\right)\end{array}\right]}}$$

In all the above formulæ it is assumed that the range of the statistics contains each of the periods an integral number of times, though they will be still approximately true if a small proportion of terms more or less than a common multiple are present. Several conclusions may be deduced at once from these formulæ. Taking the case in which two periods exist, it will be observed that the effect of one period may be to mask the effect of another. Thus if there be a two-yearly period and a four-yearly period of equal amplitude ($m_1 = m_2$) in the annual number of cases in the first year of life acting at the same time, and if $s_1 = s_2$, the correlation coefficients of the terms and the differences are of the form $-\frac{2^r}{2^r+1}$, assuming that the rate at which new cases associated with the period 2 are arising is at its mean value initially. This function has successive values $-\frac{2}{3}, -\frac{4}{5}, -\frac{8}{9}$, &c., the first of which refers to the terms themselves. The effect of the presence of a four-yearly period is thus to diminish the numerical value of the correlation, but when the successive differences are correlated the value rapidly approaches -1, the value given by the two-yearly period itself. In the case of the combination of a three-yearly period, and a two-yearly period the similar values of the correlation coefficients of the terms and the successive differences are $-{\cdot}83$, $-{\cdot}86$, $-{\cdot}89$, ...

Another point of interest may be noted. Although if two epidemics of nearly equal periods occur independently, at one time, the number of deaths due to the combination will be nearly uniform from year to year, and at another time when the epidemics synchronise there will be marked differences from year to year, yet the combined effect of this is evidently that the correlation coefficients retain very nearly the same value as they would if either disease acted alone.

Before leaving the question of the effect of periodicity on the correlation, it may be inquired how far the result is modified in the case of measles, by assuming the amplitude m which defines the rise from the lowest to the highest point, to vary at random.

When, then, the cases in the year t to $t+1$ are assumed to be expressed by $a + m_t \cos\left(\frac{2\pi t}{p} + \epsilon\right)$, where a is constant and the amplitude m_t is random, the formulæ for the correlation coefficients are

$$r = \frac{\bar{m}^2 \cos \frac{2\pi}{p}}{\bar{m}^2 + \sigma_m{}^2}$$

and

$$r_{\Delta^n} = -\frac{\bar{m}^2 2^{2n} \sin^{2n} \frac{\pi}{p} \cos \frac{2\pi}{p} - \frac{\underline{|2n}}{\underline{|n+1}\,\underline{|n-1}}\,\sigma_m{}^2}{\bar{m}^2 2^{2n} \sin^{2n} \frac{\pi}{p} + \frac{\underline{|2n}}{(\underline{|n})^2}\,\sigma_m{}^2},$$

unless $p = 2$ and ϵ is an odd multiple of $\frac{\pi}{2}$, when the terms to be correlated become the constants a and sa.

In the case of a period p with random amplitude m_t combined with the purely random term a_t first considered, a_t and m_t being independent of one another, the correlation between the number of cases in the two age groups in successive years of life is given by

$$r = \frac{\bar{m}^2 \cos \frac{2\pi}{p}}{2\sigma_a{}^2 + \sigma_m{}^2 + \bar{m}^2} \quad \left(\text{but} - \frac{\bar{m}^2}{\sigma_a{}^2 \sec^2\epsilon + \sigma_m{}^2 + \bar{m}^2} \text{ if } p = 2\right)$$

$$\text{and } r_{\Delta^n} = \frac{-\frac{\underline{|2n}}{\underline{|n+1}\,\underline{|n-1}}\left(2\sigma_a{}^2 + \sigma_m{}^2\right) + \bar{m}^2 2^{2n} \sin^{2n} \frac{\pi}{p} \cos \frac{2\pi}{p}}{\frac{\underline{|2n}}{(\underline{|n})^2}\left(2\sigma_a{}^2 + \sigma_m{}^2\right) + \bar{m}^2 2^{2n} \sin^{2n} \frac{\pi}{p}}$$

$$\left(\text{but} \quad \frac{-\frac{\underline{|2n}}{\underline{|n+1}\,\underline{|n-1}}\left(\sigma_a{}^2 + \sigma_m{}^2 \cos^2\epsilon\right) - \bar{m}^2 2^{2n} \cos^2\epsilon}{\frac{\underline{|2n}}{(\underline{|n})^2}\left(\sigma_a{}^2 + \sigma_m{}^2 \cos^2\epsilon\right) + \bar{m}^2 2^{2n} \cos^2\epsilon} \text{ if } p = 2\right)$$

There is one further hypothesis which may be considered. Although it is not one which concerns infectious diseases, it would certainly enter into the death-rate from all causes.

Let a random number of cases $b_1, b_2 \quad . \quad . \quad .$ arise from year to year in the first year of life, and let the corresponding random cases in the second year of life $c_1, c_2 \quad . \quad . \quad .$, be quite independent of $b_1, b_2 \quad . \quad . \quad .$. Fire and other accidents would supply such a phenomenon.

Then we have to correlate

$$\begin{array}{c} b_1, c_2 \\ b_2, c_3 \end{array}$$

and their differences.

The result is obviously zero in every case. When taken in conjunction with any of the other hypotheses considered, however, this new one must obviously have the effect of diminishing the correlation already yielded. For instance, let there be $a_1, a_2, \ldots$ cases of an infectious disease in the first year of life, a definite striking ration s existing between the first and second years, and in addition, let there be $b_1, b_2, \quad . \quad . \quad .$ random cases in the first year of life and $c_1, c_2, \quad . \quad . \quad .$ uncorrelated random cases in the second year of life.

Then $\qquad r = 0$

$$r_{\Delta^n} = \frac{-ns\sigma_a^2}{(n+1)\sqrt{(\sigma_a^2 + \sigma_b^2)(s^2\sigma_a^2 + \sigma_c^2)}}$$

so that the correlation for each successive difference is reduced in the fixed proportion

$$\frac{s\sigma_a^2}{\sqrt{(\sigma_a^2 + \sigma_b^2)(s^2\sigma_a^2 + \sigma_c^2)}}$$

If, again, the unconnected random terms be associated with a periodic term of fixed amplitude representing an infectious disease of striking ratio s we have

$$r = \frac{sm^2 \cos\frac{2\pi}{p}}{\sqrt{(m^2 + 2\sigma_b^2)(s^2m^2 + 2\sigma_c^2)}}$$

$$\left(\text{but } \frac{-s\,m^2\cos^2\epsilon}{\sqrt{(m^2\cos^2\epsilon + \sigma_b^2)(s^2m^2\cos^2\epsilon + \sigma_c^2)}} \text{ if } p = 2\right)$$

$$\text{and } r_{\Delta^n} = \frac{sm^2 2^{2n-1}\sin^{2n}\frac{\pi}{p}\cos\frac{2\pi}{p}}{\sqrt{\left(m^2 2^{2n-1}\sin^{2n}\frac{\pi}{p} + \frac{|\underline{2n}}{(|\underline{n})^2}\sigma_b^2\right)\left(s^2m^2 2^{2n-1}\sin^{2n}\frac{\pi}{p} + \frac{|\underline{2n}}{(|\underline{n})^2}\sigma_c^2\right)}}$$

$$\left(\text{but } \frac{-sm^2 2^{2n}\cos^2\epsilon}{\sqrt{\left(m^2 2^{2n}\cos^2\epsilon + \frac{|\underline{2n}}{(|\underline{n})^2}\sigma_b^2\right)\left(s^2m^2 2^{2n}\cos^2\epsilon + \frac{|\underline{2n}}{(|\underline{n})^2}\sigma_c^2\right)}} \text{ if } p = 2\right)$$

In this case the correlations are not diminished in the same proportion as each successive difference is taken. In certain cases, however, the effect of the random cases b and c will be less and less as further differences are taken. For instance, if $p = .2$, the correlation for the *nth* difference is

$$- \frac{1}{\sqrt{\left(1 + \frac{\frac{\underline{|2n}}{\underline{|n^2}}\sigma_b{}^2 sec^2\epsilon}{2^{2n}m^2}\right)\left(1 + \frac{\frac{\underline{|2n}}{(\underline{|n})^2}\sigma_c{}^2 sec^2\epsilon}{2^{2n}s^2m^2}\right)}}$$

in which $\frac{\frac{\underline{|2n}}{\underline{|n^2}}}{2^{2n}}$ gradually decreases from the value $\frac{1}{2}$ when $n = 1$ to zero when n gets very great, *i.e.*, the periodicity thus masked by an arbitrary element tends to become more evident when successive differences are employed, though the process is not nearly so rapid as when one periodicity masks another.

The addition of a fixed number of cases unaffected by periodic or random causes does not, of course, alter the correlations.

The results of the investigation show that quite apart from any effect that natural selection might be found to have on the correlation between the death-rates in successive years of life, there are two causes of a different nature altogether which are able to supply the high negative values of the coefficients of correlation between the differences derived from the actual figures. These two causes are (1) healthy and unhealthy years distributed at random, (2) healthy and unhealthy years distributed in a regular manner, associated in each case with the fact that there is a high degree of correlation between the death-rates in adjacent early age groups in the same year.

These causes tested in turn in cases where they have been shown to exist have produced the great body of the actual results. The effect of immunity on the differences (investigated in regard to the first hypothesis) has been seen to be practically negligible, although the small changes introduced thereby are necessarily real.

In conclusion, it is important to state that although for the sake of simplicity a stationary population has been treated, the whole of the formulæ given for the correlations between the death-rates and their differences hold approximately for the more practical case of a varying population, if instead of the actual cases the case rates, *i.e.*, ratios of cases to population, are assumed to be random, periodic, &c., according to the particular hypothesis investigated. The only change necessary is to delete M and k wherever they occur, and regard the remaining constants $\bar{a}$, σ_a, s, m, &c., as relating no longer to cases, but to rates.

ON THE MATHEMATICAL REPRESENTATION OF STATISTICAL DATA.

By Professor F. Y. EDGEWORTH, F.B.A.

SECTION IV.*—SURFACES.

THE methods which have been applied to curves in the preceding sections are now to be extended to frequency surfaces. It seemed advisable to reserve this more abstruse part of the subject for separate treatment. Indeed, the question rises whether this topic should not be omitted rather than deferred. In the application of the higher mathematics to statistics, as in the kindred study of mathematical economics, there is a limit beyond which the elaborateness of the machinery is not compensated by the value of the return. It may plausibly be suggested that this limit is reached at the entrance into a third dimension. Indeed, I might have hesitated to advance further if the representation of surfaces offered no other advantages than those which have been claimed with reference to plane curves; such as the description of groups with a view to their identification and comparison, to the evidence of changes in the causes at work and so forth.† But, as I have already had occasion to point out,‡ frequency surfaces, at least those which are of, or akin to, the "normal" type, differ not only in dimension, but in use from the plane construction in which one co-ordinate, say x, represents the size of a statistical quantity, a variate in Professor Pearson's phraseology, and the other co-ordinate, y, represents the frequency with which variates of each size occur. The use of a third dimension enables us to express not only the frequency, say z, with which assigned values of the variates x and y occur and concur, but also the relation between the most frequent values of those variates. This relation in the more perfect species of statistics is characterised by a simplicity and uniformity not elsewhere usually found outside the laws of mathematical physics. Even in the least perfect statistics, where the variates do not admit of quantitative measurement, there is sometimes presented a phenomenon of great philosophical interest (with reference to economics in particular), the availability of a mathematical law with respect to entities which present indeed the attributes of *more* or *less*, but do not admit of being measured by way of units. To obtain a better view of these useful or curious properties, it seems worth the trouble of ascending into a third dimension. The additional effort required for the purpose is not very great. For the most rewarding part of the subject before us, namely the theory of the generalized law of error in two dimensions, is adjacent to the topics which have been considered in the preceding sections. Beyond that tract extends a region in which the relation between the variates no longer corresponds even approximately to Galton's well-known law of "regression" or correlation. There exists, indeed, a correlation in a wider sense of the term; but it is to be expressed not by the properties of the normal or subnormal surfaces, but by the powerful methods which Professor Pearson has elaborated for the measurement of *Contingency*. These methods are not much aided, I think, by the analytical representation of the frequency-group under consideration. It is true that when a normal surface is *translated* so as to represent an abnormal frequency group, the (Galtonian) correlation coefficient for the original group may be taken as the measure of the connection between the actual variates. So far there is a motive for translation beyond what exists in the case of one-dimensioned statistics. But against this greater advantage of the construction is to be set the greater labour of the operation, if more than a very rough approximation is required. I shall content myself with showing how to perform the operation accurately. I leave the performance to those who may attach a higher value to the result, or a lower value to the time and labour which it costs. In the present study I deal principally with normal and subnormal groups of two-dimensioned statistics. Having thus limited the subject I compress into a single section three topics which were treated more at large with respect to plane curves, namely, the illustration, the development, and the comparison of the two constructions described as the generalized law of error and the method of translation.

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* See Sections I and II in the *Journal of the Royal Statistical Society*, Vol. LXXIX, and Section III, *J.R.S.S.*, Vol. LXXX; which are hereinafter referred to as "*ante*."

† As to the *cui bono* of the construction, see *J.R.S.S.*, LXXVII (1914), p. 300, and references there given.

‡ *J.R.S.S.*, Vol. LXXVII (1914), p. 838.

SUB-SECTION I.—CONFIRMATION OF CONSTRUCTIONS ALREADY PROPOSED.

Following the order adopted in the treatment of one-dimensioned statistics, I first offer some verifications of formulæ which have been established in previous Papers. As before, the Generalized Law of Error claims the first place.

Generalized Law of Error.—The most general expression of the Generalized Law is that symbolic formula in which the operators

$\frac{d}{dx}$ and $\frac{d}{dy}$ appear as variables of a certain function; the operand being the normal surface with co-ordinates x and y.[*] In the present study, as I propose to confine myself to the second approximation formed by the first correction of the normal law, it will be sufficient to write out explicitly the corresponding part of the series, namely, $z = z_o - \frac{1}{3\,!}\left(k_{30}\frac{d_3}{dx^3}z_o + 3\,k_{21}\frac{d^3}{dx^2\,dy}z_o + 3\,k_{12}\frac{d^3z_o}{dx\,dy_2}z_o + k_{03}\frac{d^3z_o}{dy^3}\right)$; where z_o is the ordinate of the normal surface $\frac{1}{\sqrt{\pi}\sqrt{1-r^2}}c^{\frac{(x^2-2rxy+y^2)}{1-r^2}}$; x and y are co-ordinates measured from the mean of the system (the point where co-ordinates with respect to an arbitrary origin are respectively the arithmetical mean of all the x's, the centroid of the x curve, and the corresponding mean of the y's); x and y are measured with reference to, or in units of, their respective moduli (say, c and c' with reference to some other unit); r is the coefficient of correlation $= 2\,\frac{\Sigma xy}{n}$ with reference to the modulus as unit, or more generally $2\,\frac{xy}{ncc'}$, or $\frac{\mu_{11}}{\sqrt{\mu_2\mu'_2}}$ when μ_{11} denotes the mean product of observations (measured in an arbitrary unit) and μ_2, μ'_2, denote the respective the mean squares of deviation measured in the same unit. The constant k_{30}[†] (equivalent to j in former papers) is the mean cube of deviation for the x variate divided by the cube of the modulus; in other symbols $\frac{\mu_{30}}{c^3}$. Likewise $k_{21} = \frac{\mu_{21}}{c^2c'}$; $k_{12} = \frac{\mu_{12}}{c\,c'^2}$; $k_{o3} = \frac{\mu_{o3}}{c'^3}$.

It is to be remembered, when z is written as above with the modulus of x, and likewise that of y, taken as the unit of the variable, that the ordinate thus expressed denotes the solid content standing on the element of area $\Delta x\ \Delta y$, a small rectangle of which each side is a certain fraction of the corresponding modulus. When we are employing units other than the modulus and our $\Delta x\,\Delta y$ refer to these units, it is proper to express the column standing on $\Delta x\ \Delta y$ thus interpreted as $\frac{\Delta x\ \Delta y}{c\ c'}z$. For example, if the unit is a foot and the modulus for the x variate is six inches and for y four inches, to express the solid content standing on a small square element of which the side is a quarter of an inch, it would be proper to multiply z as above defined by $\frac{1}{48} \times \frac{1}{48}\Big/\frac{1}{2} \times \frac{1}{3}$.

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[*] *See* "Law of Error," *Camb. Phil. Trans.*, Vol. XX (1905), Part II., § 6.

[†] I have not thought it necessary to adhere to the notation adopted in the paper last cited; distinguishing between k referred to an arbitrary unit and k referring to the modulus as unit.

To construct z the first step (after the determination of the constants) is to ascertain the value of z_o. This may readily be effected by the use of logarithms. For those who have access to tables giving the ordinate as well as the integral of the probability-curve the following procedure may be recommended: Put $z_o = \frac{1}{\rho} f(q) f(y)$, where $\rho = \sqrt{1 - r^2}$, f denotes the probability-curve, $\left(e.g., f(\tau) = \frac{1}{\sqrt{\pi}} e^{-\tau^2} \right) q = \frac{x - ry}{\rho}$.*

This notation is adapted to the calculation of the correction to which I proceed. For the differential coefficients of z_o may be expressed as functions of q and the corresponding quantity q', viz., $\frac{y-rx}{\rho}$. Thus $\frac{d}{dx} z_o = \frac{-2qz_o}{\rho}$; $\frac{d^2}{dx^2} z_o = \frac{1}{\rho^2}(-2+4q^2)z_o$; and so on. Put $z = z_o(1-w)$. And let $w = \frac{1}{6\rho^3}(k_{30}u_{30} + 3k_{21}u_{21} + 3k_{12}u_{12} + k_{03}u_{03})$. Then performing the differentiations prescribed by the formula for z we obtain the following values for the u's.

$$u_{30} = 12q - 8q\,;\ u_{21} = (4q' - 8rq) - 8q'q^2$$

$$u_{03} = 12q' - 8q\,;\ u_{12} = (4q - 8rq') - 8qq'^2.$$

This calculation is now to be illustrated by an example. For a good example with the preliminary work of determining the constants already preformed and ready to hand I once more have recourse to Dr. Isserlis. I adduce here the "numerical example 3" given in his paper dealing with the representation of "frequency distributions in space"; † an example of which I have already utilized a part.

The data are exhibited in the accompanying table which I copy from Dr. Isserlis' Paper. There is here recorded the number of times that each possible number of trumps was held respectively by the first hand and the second in the course of 25,000 deals such are made in the game of whist. The figures outside the square at the top and on the left denote the number of trumps held by the first and the second hands respectively. Each of the figures within the square denotes the frequency with which each binary combination occurred. For instance, the number of deals at which the first hand obtained four trumps while the second hand obtained three trumps was 2,059. The statistics are of the kind which I have called *discrete*.* Subjoined are the constants determined by Dr. Isserlis, in his notation; with our notation in brackets. His symbols are sufficiently explained by the following definition "let $p_{tt'}$ denote the (t,t')th product moment about the "centroid vertical, the elements of volume being concentrated "about the ordinates."†

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* For the convenience of those who employ tables such as Dr. Sheppard's based on *standard deviation* in preference to *modulus*, it may be well to recall that if the ordinate denoted z in Dr. Sheppard's main table, corresponding to any value of the standard deviation, say, t is f(t), then in order to obtain our $f(q)$ from his table, it is proper to put $\sqrt{2q}\,\mathrm{f}(\sqrt{2q}) = f(q)$. For example, in the instance just now given at the distance of six inches (= one modulus) on the axis of x from the origin the height of the ordinate z found from Burgess' Tables is ·20755. The corresponding value is to be found from Dr. Sheppard's Table by taking for his x, 1·414 . . $(=\sqrt{2})$ forming with the use of differences the corresponding entry between ·1476 and ·1445, and multiplying that entry by 1·414 . . .

† *Phil. Mag.*, Sept. 1914, Vol. XXVIII. p. 397. Referred to *ante*, p. 457 *et seq.*

TABLE XIX.—Showing the frequency with which different numbers of trumps were held by the First and by the Second Hand in the course of 25,000 deals at whist.

First Hand.

Second Hand.	0	1	2	3	4	5	6	7	8
0		3	22	38	76	65	26	12	4
1	5	43	159	380	531	358	153	54	4
2	20	183	746	1,458	1,590	926	323	49	7
3	42	360	1,451	2,297	2,059	934	222	34	4
4	54	542	1,588	2,048	1,497	505	101	14	1
5	45	378	906	926	506	139	25	3	
6	34	166	312	255	96	21	2		
7	10	47	69	34	16	2			
8	5	2	9	4					

Mean of First Hand (X) = 3·24944. Mean of Second Hand (Y) = 3·25048.

p_{20} (μ_{20} or μ_2) = 1·66130. p_{02} (μ_{02} or μ'_2) = 1·68318.

p_{30} (μ_{30}) = ·39094. p_{03} (μ_{03}) = ·40545.

p_{21} (μ_{21}) = −·13242. p_{12} (μ_{12}) = −·13611.

p_{11} (μ_{11}) = − 42788.

$$\rho\left(\frac{\mu_{11}}{\sqrt{\mu_2\,\mu'_2}}\right) = -\cdot 2559.$$

$$\beta_1\left(\frac{\mu^2_{30}}{\mu^3_2}\right) = \cdot 03333. \qquad \beta'_1\left(\frac{\mu^2_{03}}{\mu'^3_2}\right) = \cdot 034462.$$

$$\beta_2\left(\frac{\mu_{40}}{\mu^2_2}\right) = 2\cdot 9317. \qquad \beta'_2\left(\frac{\mu^2_{04}}{\mu'^3_2}\right) = 2\cdot 9530.$$

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* *Ante*, p. 497.

† Given by the author in a different connection at his page 381.

From these data we have now to calculate by the rules above given the frequency with which any particular pair of "Hands," *e.g.*, *four* trumps in the first hand and *three* in the second, should occur; and to compare the calculated with the actually observed number. Some results of this calculation are exhibited in Table XX; the data being given underneath in a shape adapted to our formulæ. No further explanation seems required; unless perhaps the entry "$2f(q)$" calls for the remark that the values for twice the

TABLE XX.—Showing the use of the generalized law of error.

X, Y	4, 3	5, 2	2, 2	5, 5
ξ, η	·4117, − ·1365	·9604, − ·6815	− 68545, − ·6815	·9604, ·9535
q	− ·3613	·813	− ·8895	1·246
q'	− ·0322	− ·4508	− ·8865	1·2405
$2f(q)$	·990506	·5826	·51145	·2389
$2f(\eta)$	1·10755	·7091	·7091	·4545
z_0	·0848	·032	·028	·0084
u_{30}	3·9626	5·457	− 5·044	− ·523
u_{21}	− ·00272	2·245	·078	− 7·776
u_{12}	1·3789	1·01	·196	− 7·812
u_{03}	− ·3837	− 4·677	− 5·064	− ·385
w	·026	− ·03	− ·124	·18
z	·0826	·033	·03147	·00689
ν	2060	890	787	172
n	2059	926	746	139

X = No. of trumps in first hand; Y = No. of trumps in second hand.

$x = \mathrm{X} - 3{\cdot}24944$. $y = \mathrm{Y} - 3{\cdot}25048$.

$c = \sqrt{2\mu_2} = 1{\cdot}8228$. $c' = \sqrt{2\mu'_2} = 1{\cdot}8347$. $r = \mu_{11}/cc' = -{\cdot}2559$.

$\rho = \sqrt{1 - r^2} = {\cdot}9667$.

$\xi = x/c$. $\eta = y/c'$. $q = (\xi - r\eta)/\rho$. $q' = (\eta - r\xi)/\rho$.

$f(q) = \frac{1}{\sqrt{\pi}} e^{-q^2}$. $z_0 = \frac{1}{\rho} f(q) f(\eta)/cc'$. $cc' = 3{\cdot}344$

$u_{30} = 12q - 8q^3$. $u_{21} = 4q' - 8rq - 8q'q^2$. $u_{12} = 4q - 8rq' - 8qq'^2$. $u_{03} = 12q' - 8q'^3$.

$w = \frac{1}{6\rho^3}(k_{30}u_{30} + 3k_{21}u_{21} + 3k_{12}u_{12} + k_{03}\,u_{30})$.

$k_{30} = {\cdot}0645$. $k_{21} = -{\cdot}02172$. $k_{12} = -{\cdot}02218$. $k_{03} = {\cdot}0656$.

$z = z_0(1 - w)$. $\nu = z \times 25000$. n = observed number.

ordinate of the normal error-curve with unit modulus have been copied from Burgess' Tables.*

It will be observed that in every case the result is improved by the correction "w." Even the corrected result is very incorrect in two instances. A better result may be expected if we proceed to a third *approximation* and take in terms of the order $\frac{1}{4!\rho^4} k_{tt'} \frac{4!}{t!t'!} \frac{d^4}{dx^t dy^t} z_0$ where $t + t' = 4$ and $k_{tt'}$, the analogue of our i in one dimension, is the difference between any mean product (*e.g.*, μ_{22}) as observed and what it would be if the surface were normal, viz., $\frac{1}{4}(1 + 2r^2)$ referred to or divided by the corresponding powers of the respective moduli (*e.g.*, $c^2c'^2$). I trust that some industrious student of statistics may be moved to complete my calculation by taking in the second correction, and to apply the formulæ thus improved to all the central portions† of the data in this and other examples.

Generalization of Galton's Law of Correlation.—One reason for elaborating the expression for the generalized law of error in two dimensions is that it leads to a generalization of the Galtonian law of correlation. Galton's law states that if x be an abscissa measured from the centre of a normal error-surface as origin, the value of y which is most probably and that which on an average associated with x is rx, where r is the coefficient of correlation, and x and y are referred each to its proper modulus (or standard deviation). The two properties—mode and mean—which are coincident in Galton's law become divergent in the generalization.

The locus of the mode in the y array (corresponding to an assigned value of x) may thus be restated.‡ Whereas $y = rx$ forms a first approximation to the required mode let us determine the correction $(y - rx)$ so as to render the ordinate z (for the assigned x) a maximum. Or rather let us take as the independent variable the said correction divided by $\rho\,(=\sqrt{1-r^2})$ the modulus of the array, that is q' in the symbols just now introduced. We may then write z which is to be maximized $\frac{1}{\sqrt{\pi}} e^{-x^2} \frac{1}{\sqrt{\pi}} e^{-q'^2} (1 - w)$; § where w is a sum of terms involving q and q'. As q' is treated as the independent variable it is proper to substitute for q its value in terms of q' viz., $x\rho - rq'$; observing that q_0 what q becomes when q' vanishes, $= x\rho$, and that $\frac{dq}{dq'} = -r$. Now as w consists of a sum of terms, whereof the second and higher powers are by hypothesis negligible it is allowable to write for log. $(1 - w)$ simply $-w$; and accordingly, for log. z, $-q'^2 - w +$ a constant quantity. But the value of q' which makes z a maximum is that which makes log. z a maximum. That is the value of q' for which $-2q' - \frac{dw}{dq'} = 0$, $q' = -\frac{1}{2}\frac{dw}{dq'}$. To find the value of q', therefore, we have simply to differentiate with respect to q each of the terms which make up w; treating as negligible any term in the differential coefficient which involves q' (multiplied as it must be by one of the small k coefficients). Thus the first term of w is $k_{30}u_{30}$ multiplied by a constant; where $u_{30} = 12q - 8q^3$. Differentiating with respect to q', and utilizing the values above given for q_o and $\frac{dq}{dq'}$, we have $k_{30}(-12r + 24rx^2\rho^2)$. Proceeding similarly with the other terms of w I find

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* As to my use of these tables, *see ante*, p. 458.

† The instance X = 5, Y = 5 hardly comes within this limit (*Cp. ante*, p. 69).

‡ For former statements, see *J.R.S.S.*, Vol. LXIX (1906), p. 515, Vol LXXI (1908), p. 512. *Cf.* Congress of the Institute of Statistics, 1909, Bulletin No. XVIII, p. 31. The scruples there expressed are founded on a misapprehension.

§ When q' is taken as the independent variable instead of y in z, the function expressing frequency, the divisor ρ disappears since $dq' = \rho\, dy$.

$$\frac{dw}{dq'} = \frac{1}{\rho^3}\{-k_{30}2r + k_{21}(2+4r^2) - k_{12}2r + 2k_{03}, -4\rho^2x^2(rk_{30} - k_{21}).$$

The negative of this expression divided by $2 = q'$; and $q' = (y - rx)/\rho$. Thus for the correction $y - rx$, δy as it might be called, we obtain

$$\frac{k_{30}r - k_{21}(1+2r^2) + k_{12}r - k_{03}}{\rho^2} - 2x^2(rk_{30} - k_{21}).$$

Adding δy to rx we have the equation for what may be called the regression-parabola.

The investigation of the *mean* value of the y array belongs properly perhaps to the second subsection which deals with new constructions. But the close affinity of the topic to that which has just been treated will justify its insertion here. To find the correction for the mean value of y (for any assigned x) we have simply to evaluate $-\int(y - rx)wz_0dy$* between extreme limits; or once more taking q' as the independent variable, we have for the mean of q', $-\frac{1}{6\rho^3}\int_{-\infty}^{\infty} q'e^{-q'^2}\ (k_{30}u_{30} + 3k_{21}u_{21} + 3k_{12}u_{12} + k_{03}u_{03})dq'$; where each u is to be treated as a function, implicit or explicit, of q'. Thus performing the operation indicated and substituting ρ^2 for $1 - r^2$, I find for the mean value of q', $\frac{1}{\rho}\ (k_{30}r - k_{21})\ (1 - 2x^2)$: which multiplied by ρ forms the mean value of $y - rx$.

* dy is of course identical with $d(y - rx)$, x being treated as constant.

It is interesting to observe that the parabola which is the locus of the mode has the same curvature as that of the parabola which is the locus of the mean. The two curves are parallel. The relation between the curves may be illustrated and their expressions verified by observing that the distance between the mean and the mode of an array is, as it ought to be,* the mean third power of the deviation measured from the mean of the array.

Of the two corrections proposed as generalizations of Galton's formula the *mean* appears the more serviceable. To determine the mean (of the y arrays) only two of the k coefficients need be calculated. Even that labour may be dispensed with if we are content with a rough approximation. Put l for $k_{30}\,r + k_{21}$; and equate $lc\left(1 - \frac{x^2}{c^2}\right)$ to e where e is the difference (x now measured is an arbitrary unit) between the observed mean of the y arrays (in inches or other arbitrary unit) corresponding to an abscissa x and what the mean would be if the Galtonian formula were exact. We have then, to determine l by the method of least squares, as many equations as there are y arrays. Or rather it is better to omit the equations at the extremities beyond the values of the modulus for x at which the observations cease to be available.† Proceeding thus with the data of Table XIX, omitting the array on the extreme left, and the two last arrays on the right (putting for short the modulus $c = 1{\cdot}823$, and the x and y means respectively $3{\cdot}25$ and $3{\cdot}2505$), I find for l $\cdot 007$. Whereas the value obtained from moments is $\cdot 0052$ ($= \cdot 0559 \times \cdot 0615 + \cdot 02172$).

Translation.—It remains to verify the method which has been proposed for representing frequency surfaces by translation. It will be recollected that the coefficients of translation are determined separately for the x curve and for the y curve; and are then employed to translate every element of a certain normal surface in the two directions. The procedure differs from translation in one dimension in that the operand, the generating normal locus, is not now given beforehand. The modulus for each co-ordinate is indeed still given as unity; but the other constant, r the coefficient of correlation, has to be determined from the coefficients of translation which shall have been found as aforesaid for the separate curves. As there was a little mistake in former statements, it may be well to restate the theory *ab initio.*

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* This may be shown by an adaptation of the proof given, *ante*, p. 73, that the distance of the Median from the Mean is (approximately) $-\frac{1}{3}$ j for any subnormal plane curve—a class to which a section of a subnormal surface must belong.

† *Ante*, p. 69.

Put R for the datum called by Dr. Isserlis ρ, in our notation $2\frac{\mu_{11}}{cc'}$ or $\frac{[xy]}{\sqrt{\mu_2\mu'_2}}$, ($x$ and y being co-ordinates measured from the mean as origin, and square brackets being used to denote mean values). Let X and Y be the co-ordinates of any point with reference to the assumed, the constructive, median* which is taken, as the centre of the generating normal surface. We have then

$$\mathrm{X} = a(\xi + k\xi^2 + \lambda\xi^3)\,;\ \mathrm{Y} = b(\eta + k'\eta^2 + \lambda'\eta^3)$$

Let Ξ and H be the co-ordinates of the mean or centroid with respect to the median as origin. We have then $[\mathrm{XY}] = \Xi\,\mathrm{H} + [xy]$; where $\Xi = \frac{1}{2}a\kappa$, $\mathrm{H} = \frac{1}{2}b\kappa'$.

Now $[\mathrm{XY}] = ab\,\{[\xi\eta] + \kappa\kappa'[\xi^2\eta^2] + \lambda[\xi^3\eta] + \lambda'[\xi\eta^3] + \lambda\lambda'[\xi^3\eta^3]\}$; odd terms which vanish in the average being omitted. Assigning to $[\mathrm{XY}]$ its value obtained from the immediately preceding equation and to the mean products of ξ and η their well-known equivalents,† we have $[xy] + \frac{1}{4}ab\kappa\kappa' = ab\left\{\frac{1}{2}r + \kappa\kappa'\frac{1}{4}(1+2r^2) + \frac{3}{4}(\lambda+\lambda') + \lambda\lambda'\left(\frac{9}{8}r + \frac{3}{4}r^3\right)\right\}$. Cancelling the term $\frac{1}{4}ab\kappa\kappa'$ on both sides, substituting for ab its equivalent $2\sqrt{\mu_2\mu'_2}\,/\,\sqrt{gg'}$ where $g = 1 + \kappa^2 + 3\lambda + \frac{15}{4}\lambda^2$, and g' is similarly related to κ' and λ', we have

$$\frac{[xy]}{\sqrt{\mu_2\mu'_2}} = \left\{r + \kappa\kappa' r^2 + \frac{3}{2}(\lambda + \lambda')r + \lambda\lambda'\left(\frac{9}{4}r + \frac{3}{2}r^3\right)\right\}/\sqrt{gg'}.$$

The left side of this equation consisting of the given quantity R, we have thus obtained a cubic equation for r. In the case to which the present study is mostly confined, where the κ and λ coefficients are small (the surface being subnormal) r differs from R by a small quantity. We may therefore put for r in the last written equation $\mathrm{R} + (r - \mathrm{R})$; and then neglecting higher powers of $(r - \mathrm{R})$ and other small magnitudes, and cancelling R on both sides of the equation, write

$$r - \mathrm{R} = -\kappa\kappa'\mathrm{R}^2 - \frac{3}{2}(\lambda + \lambda')\,\mathrm{R}.$$

We are now in a position to pass from any assigned point $\xi_1\eta_1$ on the area of the generating surface to the corresponding point $x_1\,y_1$ on the area of the generated surface; and inversely. It remains to consider how the height of the ordinate is affected by the transition. Upon the principles laid down with respect to plane curves it is proper to consider that the ordinate ζ at the point $\xi_1 \eta_1$ of the generating curve is depressed through translation in the direction of the axis x by the divisor $a\,(1+2\kappa\xi+3\lambda\xi^2)$, and through translation in the direction of the axis y by the divisor $b\,(1+2\kappa'\eta+3\lambda'\xi^2)$. If we regard the solid content pertaining to a small rectangle $\Delta\xi\,\Delta\eta$ on the area of the generating surface as concentrated into an ordinate at the point $\xi_1\eta_1$, then the corresponding rectangle at the point $x_1\ \ y_1$ for the generated surface $\Delta x\,\Delta y = \omega\,\Delta\,\xi\,\Delta\eta$, where $\omega = ab\,(1+2\kappa\xi + 3\lambda\xi^2)\ (1+2\,\kappa'\eta + 3\lambda'\eta^2)$. The solid content pertaining to both rectangles being the same, it follows that z (the height of the translated column) $=\dfrac{1}{\omega}\,\zeta$.

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* *Ante*, p. 466.

† See *J.R.S.S.*, Vol. LXXVII (1914), p. 840.

I proceed to test this construction by applying it to an example: another of those for which I am indebted to Dr. Isserlis, namely, the first in the paper to which I have referred.* His table which I transcribe as my Table XXI is described by him as "the theoretical "frequency distribution of black balls in a draw of four balls followed "by one of three out of a bag containing four white and six black "balls, the draw being repeated 210 times." I subjoin those of the coefficients calculated by him which I am about to utilize:—

TABLE XXI.—Showing the theoretical frequency of black balls under certain conditions.

	0	1	2	3	4
0				4	3
1			18	36	9
2		12	54	36	3
3	1	12	18	4	

p_{10} (the mean of the X's) $= 2\cdot4$. p'_{01} (the mean of the Y's) $= 1\cdot8$. p_{20} $(\mu_2) = \cdot64$; p_{30} $(\mu_{30}) = -\ \cdot032$; $p_{21} = \cdot016$. p_{02} $(\mu'_2) = \cdot56$; $p_{03}\,(\mu_{03}) = -\ \cdot056$; $p_{12} = \cdot032$. $p_{11}\,(\mu_{11}) = -\ \cdot32$. ρ (R) $= -\ \cdot5345$.

Our first step is to determine the coefficients of translation separately for each of the curves, the x curve in the plane xz and the y curve in the plane yz. This has already been done for the x curve in a former section, where we found $\kappa = o$, $\lambda = -\ \cdot0225$, and $a = 1\cdot1704$. For the y curve I find as a first approximation

$$\chi(=\kappa^2) = \frac{4}{9}\beta = \frac{4}{9}\ \frac{1}{8}\beta_1 = \cdot001\,;\ \text{and}\ \lambda = \frac{1}{12}(\beta_2-3) - \frac{8}{9}\beta = -\cdot034.$$

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* *Loc. cit.*, p. 374.

For a second approximation I find $\lambda = -\cdot 04$ and $\beta = \cdot 0011$. The corresponding value of b is 1·1236. We have now obtained x and y the co-ordinates of any point with reference to the Median in terms of ξ and η. For the position of the "constructive median" we have the abscissa with reference to the centroid $(= -a\frac{1}{2}\kappa)$, zero, and for the ordinate $(= -b\frac{1}{2}\kappa') = -\cdot 0185$; say, 1·782 (on the axis Y representing a number of black balls). From these results we obtain for the approximate value of r

$$-\cdot 5345 - 0 \times \cdot 033\text{R}^2 - \frac{3}{2}(-\cdot 0225 - \cdot 04) \times -\cdot 5345.$$

Whence for r we obtain $-\cdot 495$. I have verified this approximation by solving the cubic equation, which gives the more exact value of r (on the supposition that the other coefficients are exactly determined). For the root of this cubic I find $-\cdot 48$. I have taken $-\cdot 49$ as a value suited to my rough calculation.

We are now in a position to translate each element of the normal surface with unit modulus and correlation coefficient r; thereby generating a surface which is presumably representative of the given distribution.

But in order to test the accuracy of the representation it is necessary to proceed inversely, and to determine for each or any point x, y the corresponding point ξ,η, and thence to calculate the height of the ordinate at xy, viz. ζ/ω. For example, take the point or square in Table XXI for which X, the number of black balls at the first drawing, is three, and Y, the number at the second drawing, is two. Then for x we have $3 - 2\cdot 4 = \cdot 6$; and for $y - (1\cdot 8 - 1\cdot 782) = \cdot 218$. For ξ then we have the cubic equation $-\cdot 0225\xi^3$ . . $+ \xi = \cdot 6/a = \cdot 51264$. Whence I find $\xi = \cdot 51572$. Likewise $-04\,\eta^3 + \cdot 033\,\eta^2 + \eta = \cdot 218/b = \cdot 19402$. Whence $\eta = \cdot 1934$. To evaluate ζ I employ again the convenient formula $f(q)f(\eta)/\rho$; where $q = \xi - r\eta = (\cdot 5157 + \cdot 49 \times \cdot 1934) / \cdot 8717 = \cdot 7$. With the aid of Burgess' tables I thus find for ζ ·2155. This result is to be divided by ω which, according to the formula and figures already given, $= 1\cdot 1704 \times 1\cdot 1236 \times (1 - 3 \times \cdot 0225 \times \cdot 5157^2)(1 + 2 \times \cdot 033 \times \cdot 1934 - 3 \times \cdot 04 \times \cdot 1934^2) = 1\cdot 302$. In fine, we obtain for the proportionate frequency of the double event under consideration $\cdot 2155/1\cdot 302 = \cdot 166$. This fraction multiplied by 210, the total number of observations, gives for the calculated number of occurrences 35. The true number was 36.

Table XXII exhibits the grounds and results of this and three similar computations. The results are better than might have been expected, considering how few and how far from independent are the causes of which the observations are the outcome.

TABLE XXII.

X, Y	3, 2	3, 1	2, 2	2, 1
x, y	·6, 218	·6, – ·782	– ·4, ·218	– ·4 – ·782
ξ, η	·5157, ·1934	·5157, – ·729	– ·3427, ·1934	– ·3427 – ·729
q	·7	– ·182	– ·2844	·803
$2f(q)$	·69127	1·0916	1·04	·5921
$2f(\eta)$ ...	1·0869	·6632	1·087	·6633
ζ	·2155	·2162	·3242	·1124
ω	1·3	1·31	1 298	1 ·3
z	·166	·165	·249	·0864
ν	35	35	53	18
n	36	36	54	18

X and Y are the numbers of black balls at the first and second drawing, respectively.

$x = (X - 2{\cdot}4)$. $y = (Y - 1{\cdot}782)$.

ξ is the root of the equation $\lambda\xi^3 + \kappa\xi^2 + \xi = x/a$ (ξ and x having their *signs*).

η is the root of the equation $\lambda'\eta^3 + \kappa'\eta^2 + \eta = y/b$ (η and y having their *signs*).

$\kappa = 0$. $\lambda = -{\cdot}0225$. $a = 1{\cdot}1704$. $\kappa' = {\cdot}033$. $\lambda' = -{\cdot}04$. $b = 1{\cdot}1236$.

$q = \xi - r\eta$. $r = -{\cdot}49$. $\rho = \sqrt{1 - r^2} = {\cdot}8717$

$f(q) = \dfrac{1}{\sqrt{\pi}} e^{-q^2}$. $\zeta = f(q)f(\eta)/\rho$. $\omega = ab(1 + 2\kappa\xi + 3\lambda\xi^2)(1 + 2\kappa'\eta + 3\lambda'\eta^2)$.

$z = \zeta/\omega$. $\nu = = 210\,z$, the calculated number of black balls. n is the true number.

SUB-SECTION II.—SOME NEW CONSTRUCTIONS.

Use of percentiles for the Generalized Law of Error.—This topic calls for a preface which was not required in the case of plane curves.* For whereas the data appropriate to the method of percentiles are blocks of area or solid content as distinguished from ordinates, it is not obvious in the case of surfaces how such data are connected with the coefficients. We may without loss of generality † confine ourselves to the case in which the block under consideration is defined by two vertical planes respectively parallel to the planes of xy and

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* *Ante*, p. 485.

† *Cf. J.R.S.S.*, Vol. LXXVII (1914), p. 848.

xz, passing through a given point x_1y_1. Then the solid content of the block may be written in notation which has been explained :—

$$\int_{x_1}^{\infty}\int_{y_1}^{\infty} dxdy \left(z_o - \frac{1}{3\,!}k_{30}\frac{d^3z}{dx^3} - \frac{1}{2}k_{21}\frac{d^3z_o}{dx^2dy} - \frac{1}{2}k_{12}\frac{d^3z_o}{dxdy^2} - \frac{1}{3\,!}k_{03}\frac{d^3z_o}{dy^3}\right)$$

The first, the normal term of the integral, may be evaluated by the formula by which Professor Pearson has connected the coefficient of correlation with the content of a block such as we are considering.* Of the remaining four terms, the intermediate two integrals may at once be written down, namely :—

$$-\frac{1}{2}k_{21}\left(\frac{dz}{dx}\right)_{\substack{x=x_1\\ y=y_1}}, \quad -\frac{1}{2}k_{12}\left(\frac{dz}{dy}\right)_{\substack{x=x_1\\ y=y_1}}$$

In the case of the remaining two terms we go *one* step easily. Thus the fourth term becomes $-\frac{1}{3\,!}k_{30}\int_{y_1}^{\infty}dy\left(\frac{d^2z}{dx^2}\right)_{x=x_1}$. To evaluate this integral put for the expression in brackets its value in terms of q' : Whence there results an expression of the form

$$(\mathrm{A} + \mathrm{B}q' + \mathrm{C}q'^2)\frac{1}{\sqrt{\pi}}e^{-q'^2}dq'$$

to be integrated between the limits *infinity* and what q' becomes when $y = y_1\,(x' = x_1)$, viz., $(y_1 - rx_1)/\rho$, say q_1. Performing the work I find for the integral

$$-\frac{1}{6}k_{30}\left\{\mathrm{F}(q'_1)(-2 + 4x_1^2) + f(q'!)\left(2\left(\frac{r}{\rho}\right)^2 q'_1 - 4\frac{r}{\rho}x_1\right)\right\}f(x_1)\,;$$

where $f(q'_1)$ denotes as before the ordinate of the probability curve with unit modulus at the abscissa q_1', and $\mathrm{F}(q'_1)$ denotes the integral of this curve between infinity and q'_1. The corresponding integral for the last term is found by substituting in the above expression k_{03} for k_{30} and q'_1, for q_1. The intermediate terms in the same notation are

$$+\frac{1}{2}k_{21}\frac{2q_1}{\rho^2}f(q_1)f(y_1), \text{and } + k_{12}\frac{2q}{\rho_2}f(q'_1)f(x_1).$$

These formulæ may be simplified by the use of *principal* axes. Put $\Xi = \frac{\eta + \xi}{\sqrt{2(1+r)}}$ and $\mathrm{H} = \frac{\eta - \xi}{\sqrt{2(1-r)}}$; and you have a generating normal surface for which the coefficient of correlation is zero. Accordingly it is easy to determine the coefficients K_{30}, K_{21}, &c.,† pertaining to the given frequency-surface as referred to principal axes. With these coefficients we can readily compute the frequency at any point defined by co-ordinates referring to principal axes. And between these co-ordinates and the original system there is a simple linear relation.

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* Tables for Statisticians, No. 29; or the formulæ given by Dr. Sheppard (*Camb. Phil. Trans.*, Vol. XIX) may be used.

† See my article on "Law of Error," *Camb. Phil. Trans.*, Vol. XX (1905), p. 118.

Let us take for an example the statistics which Weldon obtained by throwing two dozen of dice, with six common to each dozen, and observing in each dozen the number of dice which presented more than three points.* If the dice had been perfectly fair the mean number of cases with more than three points, cases which we may describe as *successes*, would have been *six*; the coefficient of correlation would be $\frac{1}{2}$ and the standard deviation $\left(\sqrt{npq}\right)$ would be $\sqrt{3} = 1\cdot73205$. But in fact, the faces with large numbers of points were rather more frequently presented; the average number of successes being about $6\cdot13$.† The standard deviation is accordingly reduced to $1\cdot7317$; and the coefficient of correlation no doubt suffers a correspondingly slight modification. The mean third power of either variate, which would be zero if the dice were perfectly fair, becomes in consequence of the asymmetry $\frac{\cdot51 - \cdot49}{2\sqrt{2 \times 12 \times \cdot49 \times \cdot51}} = \cdot004$ nearly. The other k coefficients, k_{21} and k_{12}, would be, if r were exactly $\frac{1}{2}$, each $= \frac{1}{2}k_{30}\left(= \frac{1}{2}k_{03}\right)$; and we may safely take that as the value of these small quantities.

Let us now apply these data to the calculation of the solid content of a block which I transcribe here, comprising the cases for which the number of successes at both throws was eight or more. We may consider the point by which this block is defined (by vertical planes passing through the point) to be $(7\cdot5, 7\cdot5)$. The distance of each co-ordinate from the Mean $= 7\cdot5 - 6\cdot13 = 1\cdot37$. This distance divided by the standard deviation, taken as $1\cdot732$, gives $\cdot791$ for the "h" and the "k" employed by Professor Pearson in the calculation to which I have referred. Taking the value in his table near $\cdot791$, viz. $\cdot78919$, and utilizing his τ_1 τ_2, etc., up to τ_6 I find for the content of the block, $\cdot097$. That is the proportion of the block to the whole surface, of the piece cut out to the entire cake.

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* The distribution is exhibited in my article on "Probability" in the *Encyclopædia Britannica*, p. 394.

† Weldon in his Presidential address to the Zoological Section of the British Association, 1898, gives 6·135 as the Mean of a group which is evidently identical with (though not tabulated in such details as) one of those to which I am now referring.

Cf. Pearson, *Phil. Mag.*, 1900, p. 168.

The total number of the observations being 4,096, we have for the first approximation to the number of cases with at least eight successes, 397. The actual number is 392. This result does not leave much play for the second approximation. And, in fact, its contribution is very small owing to the smallness of the k coefficients.

TABLE XXIII.—Showing part of a frequency group compiled by Weldon to illustrate correlation.

8	*9*	*10*	*11*	
5	1			*11*
27	19	2	1	*10*
57	54	15	4	*9*
118	59	25	5	*8*

So far we have shown how to pass from given k coefficients to the content of a solid block of frequency. The inverse transition from a given content to the determination of the coefficients is not far to seek. Call e_1 the difference between the first approximation, the integral of the normal surface z_0, and the given content U, and put $E_1 = e_1 - (a_1 k_{30} + b_1 k_{21} + c_1 k_{12} + d_1 k_{03})$; where a_1, b_1, c_1, d_1 are coefficients calculated from the given co-ordinates x_1 y_1 according to the formula just now given. Determine the four k coefficients such that the sum of terms of the type E^2/U may be a minimum.

For instance, suppose that the given point with reference to the statistics cited from Weldon is (8·5, 8·5); delimiting all the cases in which there occurred nine or more successes. We have then $x_1 = y_1 = (8{\cdot}5 - 6{\cdot}13)/\sqrt{2 \times {\cdot}49 \times {\cdot}51 \times 12} = {\cdot}97$; say for convenience of calculation 1. We have then, $\left(r \text{ being taken } = \frac{1}{2}\right)$, $q_1 = q'_1, = \frac{1}{2} \Big/ \sqrt{\frac{3}{4}} = \frac{1}{\sqrt{3}}$, = say ·577; $2\,f(q_1) = {\cdot}808$ nearly; $2\,f\,(x_1) = {\cdot}4151$; $2\ \mathrm{F}\,(q_1) = 1 - {\cdot}5855$. Whence for the coefficients of k_{30} and k_{03} ($a_1 = d_1$) I find ·012, and for the coefficient of k_{21} and k_{12}, ·035. Also the content as determined by the Pearsonian formula on the supposition of normality is about ·025. Whereas, in fact, it is 96/4096 = 0234. Thus the relevant element of the quantity which is to be minimized is

$$(- {\cdot}002 + {\cdot}012\,k_{30} + {\cdot}03\,k_{21} + {\cdot}03\,k_{21} + {\cdot}012\,k_{03})^2/{\cdot}0234.$$

The sum of constituents of this type differentiated separately by each of the k's yield four linear equations for the four sought k coefficients.

Composite Translation.—In order to employ as many constants, to satisfy as many data, as those which occur in the second approximation of the generalized law the method of translation requires to be further developed. If we are proceeding by way of moments, the additional data k_{21} and k_{12} will now have to be taken into account. Here may be raised the question whether it was allowable to ignore these data hitherto. Are we indeed now building a second storey on a secure basement, or not rather completing a fundamental arch which without that completion could possess no strength and afford no support ? In defence of the plan which has been so far pursued —utilizing k_{30} and k_{03} while ignoring the cognate quantities k_{21} and k_{12}—I invoke the principle which has been called " unverified " or (by Boole) " intellectual " probability. According to this principle a variable magnitude which as often and to the same finite extent takes on a value above as one below zero may sometimes be treated as zero.* No doubt it is a delicate matter to decide what events may be treated as *a priori* equiprobable. The general abstract principle must be informed by knowledge of particular circumstances. In the case before us we have the experience that the ignoration of data and coefficients has worked very well *in pari materiâ* ; for instance, in the hands of Dr. Bowley the use of j for the generalized law of error without the coefficient which is often of the same order, i. So in the hands of the present writer the use of the first coefficient of translation (now called κ) in the absence of the second coefficient λ has proved consistent with a very accurate representation of statistics.†

For the formation of a judgment which depends largely on a sort of sense acquired by experience *in pari materiâ* appeal to authority is legitimate. I am fortunate in being able to adduce a very high authority, even that of Professor Pearson. While defending his own theories of association Professor Pearson lends support to our methods. Examining several concrete two-dimensioned frequency groups and dividing each of them into four blocks by two vertical planes through a point (after the manner which I have just now illustrated*), he finds with respect to each surface that for many different such points—many different fourfold divisions of the surface—there prevails between the area of a demarcated block (such as we have called a corner compartment†) consistently and very approximately between the solid content of the actual surface and a hypothetical correlation-coefficient that very relation which is postulated by translation of the simple kind that we have hitherto practised.‡ The reasons which Professor Pearson gives for using this construction with respect to "fourfold tables" in general seem to countenance that principle of probabilities on the strength of which I have ignored certain data and the corresponding coefficients, in particular k_{21} and k_{12}. I cordially assent to the spirit of the following judgment: "You cannot free yourself from some "assumption as to the nature of the distribution when you are dealing "with the association of attributes. And in ignorance of what "the true distribution may be what assumption will help you to the "most probable result? On the basis of a very large experience "of frequency curves and surfaces we have no hesitation in saying "that up to the present time no distribution has been proposed "which roundly represents experience so effectively as the Gaussian "frequency." I note too and accept as decisive Professor Pearson's emphatic testimony as to the prevalence *in rerum naturâ* of an approximation to the normal law as what "roundly represents "experience" . . . "close enough for all practical purposes"—close enough, as I venture to infer, for the realization of that *sub-normal* type to which I have all along, and particularly in the present section, accorded preferential treatment.

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* As to this species of probability, see article on " Probability," *Encyclopædia Britannica* (ed. XI), pp. 377–8. Compare *Economic Journal*, Vol. XXII (1912), p. 205, and Vol. XXIII (1913), referring to Professor Pigou's use of the conception in his *Wealth and Welfare.* Compare, too, his use of it in the Appendix, No. LXXX, to the Royal Commission on the Poor Laws, 1910 [Cd. 5068], Vol. IX, p. 982 :—" Unknown facts are as likely to confirm as to " conflict with known facts. Hence, if one policy is *certainly* superior in " economic effect, it is *probably* superior . . on the whole."

† See *J.R.S.S.*, Vol. LXI. (1898), p. 9 *et seq.* If it is objected that the cases are not parallel because the ignored i is of a smaller order than the retained j, I reply that i is indeed smaller in respect of its denominator, but may be indefinitely larger in respect of its numerator (in case of symmetry).

I am free to accept Professor Pearson's testimony without taking part in the controversy which evoked some of his authoritative dicta. I am in the happy position of being supported by much that Professor Pearson has said, while supporting much that Mr. Yule has said. I quite agree with Mr. Yule that the "strained normal," * as he calls what I call simple as distinguished from composite translation, is not perfectly realized in the concrete. It is a type which may be used in our ignorance or indolence *faute de mieux.* But it must be recognized that in different directions there are serious deviations from the type, that in this sense it is an "untrustworthy approximation." I shall prove this with respect to subnormal coefficients, small strains; and I think it highly probable that the relation between the simple and the composite elements of translation which is observed on a small scale would hold good in cases of greater abnormality. The truth of these statements will appear when we seek to utilize the hitherto ignored product moments of the third degree.

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* Above, p. 279.

† See *J.R.S.S.*, Vol. LXXVII (1914), p. 844, *et seq.*

‡ *Loc. cit.*, p. 162. "One of the present writers," pursues Professor Pearson, no doubt referring to himself, "has indicated over and over again how "it [the Gaussian frequency] fails, and he has measured the significance of its "failure, but has always recognised that he must put against this the large "percentage of cases in which it gives reasonable results, close enough for all "practical purposes." *Cf. loc. cit.*, p. 300, *et passim.* See also Professor Pearson's memoir "On a novel mode of regarding the Association of two "Variates" (Mathematical Contribution XVIII), *Drapers' Co. Research Memoirs,* Biometric Series VIII, *passim, e.g.*, p. 4, p. 11, p. 20.

Two simple plans for taking account of the data represented by the constants k_{21} and k_{12} may be suggested. Let us add to the expression for x/a (the distance from the median referred to the parameter a), viz., $\xi + \kappa\xi^2 + \lambda\xi^3$, an additional term of the same magnitude, say $\gamma\eta$ or $\gamma\eta^2$, and likewise to the expression for y/b either $\gamma'\xi$ or $\gamma'\xi^2$. I adopt the *latter* alternative as more convenient for calculations of the approximative character to which in this section I confine myself. I make abstraction of the λ coefficients and corresponding data. Let $X = a(\xi + \kappa\xi^2 + \gamma\eta^2)$; $Y = b(\eta + \kappa'\xi^2 + \gamma'\eta^2)$.

We have then $[X] = a\frac{1}{2}(\kappa + \gamma)$; $[Y] = b\frac{1}{2}(\kappa' + \gamma')$. Whence by parity of reasoning with that employed in the simpler case we obtain for μ_{11} the mean product of x and y measured from the centroid as origin

$$[xy] = ab\left\{\frac{1}{2}r + \frac{1}{2}\kappa\kappa' r^2 + \frac{1}{2}\gamma\gamma' r^2 + \frac{1}{2}(\kappa\gamma' + \gamma\kappa')\right\}$$

To eliminate a and b from this and the expression for other mean products (and powers) we require the values of μ_2 and μ'_2 terms of the sought coefficients. By parity of reasoning we obtain

$$[x^2] = \frac{1}{2}a^2(1 + \kappa^2 + 2\gamma\kappa r^2 + \gamma^2);\ [y^2] = \frac{1}{2}b^2(1 + \kappa'^2 + 2\gamma'\kappa' r^2 + \gamma'^2).$$

By means of these equations eliminating a and b we obtain an equation connecting the five unknown quantities with the given quantity R. Four other equations are obtained by proceeding similarly with the third powers and products. In general, in order to eliminate a and b it would be proper to form the expressions (in terms of the sought quantities) for the *squares* of the coefficients k_{30}, k_{21}, k_{12}, k_{03}. But if we neglect magnitudes of the third order k^3, $k^2\gamma$, etc., we have at once $k_{30} = \frac{3}{2}\kappa + \frac{3}{2}\gamma r^2$; $k_{21} = r(\kappa + \gamma) + \frac{1}{2}(\gamma' + \kappa' r^2)$; with corresponding expressions for the other two k constants. For r in these equations we may substitute R, since r evidently differs only by a small quantity from R. Likewise R may be employed in the equations connecting a and b with the given and the found quantities. Neglecting powers of $(r - \text{R})$ above the first in the expression which is equated to $[xy]$ we have a simple equation for the correction of R. It remains only to determine $ab\,\omega$ the dilatation due to translation. According to the rule for change of variables we have $\omega = 1 + 2\kappa\xi + 2\kappa'\eta + 4\xi\eta\,(\kappa\kappa' - \gamma\gamma')$. We are now in a position to construct the group by passing from any assigned ξ, η to the corresponding xy. But to test the construction passing from any given x, y to the corresponding ξ, η there have to be solved two simultaneous equations of the second degree.

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* *J.R.S.S.*, Vol. LXXV (1912), p. 613, *et passim.* I don't know that there is a recognised term for the distinction which I have taken between simple and composite translation. It is not identical with the difference between "homogeneous" and "heterogeneous" strain (as used by Tait and Thompson at least).

For an example let us once more have recourse to Dr. Isserlis, and again utilize his "numerical example 3." Adapting numerical data given on a former page to the formulæ just now given I obtain the following four equations:—

$$(1)\ k + \cdot256^2\gamma\left(= \frac{2}{3}k_{30}\right) = \cdot04297\,;\quad (2)\ k' + \cdot256^2\gamma' = \cdot04376.$$

$$(3)\ -\cdot256\,(k + q) + \frac{1}{2}(\gamma' + \cdot06554\,k') = -\cdot02172.$$

$$(4)\ -\cdot256\,(k' + q') + \frac{1}{2}(\gamma + \cdot06554\,k) = -\cdot02218.$$

Eliminating k and k' from equations (3) and (4) by means of equations (1) and (2), I find simultaneous equation for γ and γ' from which there results $\gamma = -\cdot047$ nearly, $= \gamma'$. Whence $\kappa = \cdot046$ $\kappa' = \cdot047$; $a = 1\cdot819$, $b = 1\cdot831$. The correction of R proves to be about $+\cdot004$, whence for r we obtain $-\cdot252$; $\rho(=\sqrt{1 - r^2}) = \cdot9677$.

To test this construction let us calculate the number of times that there occur four trumps in the first hand coupled with three in the second hand; the ordinate at the point $\text{X} = 4$ $\text{Y} = 3$. For the corresponding co-ordinates of the generating surface we have the not very difficult simultaneous equation:

$$1\cdot819\,(\xi + \cdot046\,\xi^2 - \cdot047\,\eta^2) = (4 - 3\cdot2494).$$
$$1\cdot831\,(\xi\eta + \cdot047\,\eta^2 - \cdot047\,\xi^2) = (3 - 3\cdot2505).$$

From which I obtain $\xi = \cdot427$, $\eta = -\cdot152$.

Whence $q\,(= (\xi - r\eta)/\rho) = \cdot402$.

For ζ $(= f(q) f\ (\eta) / \rho)$ I find ·2949. For ω I find 3·5; and accordingly for z $(= \zeta/\omega)$ ·084. Whence the calculated number of occurrences $(= 2500\, z) = 2100$. Whereas the actual number was 2060.

It appears from this construction that γ, the coefficient introduced by composite translation, is of the same order as the κ'*s* proper to simple translation. The inadequacy of simple translation, that it is an "untrustworthy approximation," may be shown more simply by observing that if the given groups could be regarded as a "strained "normal" in Mr. Yule's phrase our coefficient γ should be zero. Accordingly the equation for k_{21} would reduce to $r\kappa + \frac{1}{2}\kappa' \mathrm{R}^2$; where κ and κ' have the values proper to the hypothesis of simple translation, that is respectively $\frac{2}{3}\, k_{30}$ and $\frac{2}{3}\, k_{03}$. We thus obtain a simple criterion for the adequacy of simple translation, viz., $k_{21} = \frac{2}{3}\, (k_{30} + \frac{1}{2}\, k_{03}\, \mathrm{R}^2)$. This criterion is very badly fulfilled in the example before us. The calculated value of k_{21}, viz., $-$ ·107, is half the true value $-$ ·217. The criterion is even worse fulfilled in the case of Dr. Isserlis' example 1, for which I find the calculated k_{21}, viz., $·01/\sqrt{8}$ to be about a third of the given k_{21}, viz., $·033/\sqrt{8}\left(= \frac{p_{21}}{p_{20}\sqrt{p_{02}}\sqrt{8}},\ \text{where } p_{21} = 16,\ p_{20} = 64,\ p_{02} = ·56\right)$. The criterion is better fulfilled in the above cited statistics which Weldon compiled; where k_{21} $(= k_{12})$ is, actually, $= \frac{1}{2}\, k_{30} \left(= \frac{1}{2}\, k_{03}\right)$, and according to the criterion $\left(r \text{ being very nearly } = \frac{1}{2}\right)$ $k_{21} = \frac{2}{3}$ $(k_{30} - r^2\, k_{03}) = \frac{2}{3}\frac{3}{4}\, k_{30}$, very nearly.

These conclusions relate to subnormal frequency groups.* But the relation between the κ and the γ coefficients which has been observed on the small scale may confidently be affirmed of abnormal statistics. The second approximation afforded by simple translation will be equally untrustworthy; and its incorrectness will no longer be masked by the smallness of the second with respect to the first approximation (the normal surface). To obtain a trustworthy approximation it would be necessary to solve in their entirety the five equations for which we have substituted linear approximations.

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* It should be remarked that for a first approximation the coefficient λ does not affect r, nor the κ and γ coefficients; accordingly does not affect the criterion above given.

But this would be a tremendous task considering the high powers of the variables in each of the equations. Besides, it would be no longer safe to omit the λ coefficients. But their inclusion would introduce five new equations with five new variables each involved in the fourth degree !

An equally marked distinction between subnormal and abnormal frequency-groups is presented when we turn to that variety of composite translation which makes use of *percentiles.* If we may assume that the γ's and other coefficients of translation are small, they may be determined upon the principle employed above in connection with the generalized law of error*; by finding the values of the coefficients from which the observed set of errors would probably have resulted ; these errors each consisting of the difference between actual and the calculated value of a certain block. Consider for instance the block which is defined by vertical planes parallel to the axes of x and y respectively through the point $x_1\ y_1$. Supposing a and b known approximately ; and making abstraction of other coefficients, consider the increment of solid content due to the introduction of the small coefficient γ. At every point from y_1 to ∞ on the y ordinate passing through the point $x_1\ y_1$ there will be a transference of matter from the negative to the positive side of the plane parallel to yz equal to $ab\gamma\eta^2\zeta\Delta\eta(\xi=\xi_1)$, where ξ and η as throughout are co-ordinates pertaining to the generating normal surface. The integral of this expression from η_1 to ∞ gives the coefficient of γ, which is to be employed like a_1, b_1, &c., the coefficients of k_{30}, k_{21}, &c., on an earlier page.†

A similar integration is required to determine a *quaesitum* which is peculiar to this construction. Hitherto in using translation where the data consist of percentiles we have taken the observed and adjusted Median as a που στῶ. But now we have to determine the position of a "constructive" Median with reference to the Median given by observation. For suppose that the ξ_1, η_1 of the last paragraph is at the origin (of the generating surface). Then the introduction of γ will cause a displacement of solid content along the axis of η and therefore of y in a positive direction (if γ is positive) both above, *and also below*, the axis of ξ (and of x). Thus the Median of the x curve will not correspond to $\xi = 0$, but to a value of ξ, say δ, which is such that, if α is the amount of matter transferred, $\zeta_o\,\delta = \alpha$, ζ_o being the ordinate of the x curve at the origin. Whence $\delta = \frac{1}{2}\,a\,b\,\gamma\,\rho^3\sqrt{\pi}$. This difference may be treated as we have treated the difference between the observed centroid and the "constructive Median." But probably it would be better when using percentiles to adopt a construction which does not involve this displacement, namely, the first of the alternatives just now mentioned.* When we start from initial values of the sought coefficients other than zero analogous methods of approximation would still be possible, but probably very laborious.

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* Above, p. 281.

† Above, *loc. cit.*

The inadequacy of simple translation, the impracticability of composite translation, constitutes an important point in the comparison between the use of the generalized law of error and the method of translation in two dimensions. This topic should be placed under a separate heading if we were to follow the arrangement of our earlier sections. But it seems unnecessary to create a third subsection merely to point out that the balance between the two methods is altered in one respect. Whereas in one dimension the generalized law is theoretically at least preferable for subnormal cases, while translation has the advantage of being applicable to abnormal cases, this advantage is greatly reduced in two dimensions, while that preference still subsists.

I shall go on in a final section to compare the two methods, not with each other, but with other constructions which have been proposed for the mathematical representation of statistics.

* Above, p. 284.

WHOLESALE PRICES OF COMMODITIES IN 1916.

BY THE EDITOR OF THE "STATIST."

(In continuation of Mr. A. Sauerbeck's figures.)

THE following table shows the course of the wholesale prices of forty-five commodities during the last twenty years as compared with the standard period of eleven years, 1867-77, which in the aggregate is equivalent to the average of the twenty-five years 1853-77 (see the *Journal*, 1886, pp. 592 and 648, and 1893, pp. 220 and 247). There are added corresponding data for 1896, the year of lowest prices, and for 1873, just after the Franco-Prussian war :—

Summary of Index Numbers. Groups of Articles, 1867-77 = 100.

	Vegetable Food (Corn, &c.).	Animal Food (Meat, &c.).	Sugar, Coffee, and Tea.	Total Food.	Minerals.	Textiles	Sundry Materials.	Total Materials	Grand Total.	Silver.*	Wheat Harvest.†	Average Price of Consols.‡ £	Average Bank of England Rate.‡ Per cent.
1873	106	109	106	107	141	103	106	114	**111**	97·4	80	$92\frac{1}{2}$	4·750
1896	53	73	59	62	63	54	63	60	**61**	50·5	112	$110\frac{3}{4}$	2·483
1897	60	79	52	65	66	51	62	59	**62**	45·3	97	$112\frac{13}{32}$	2·638
'98	67	77	51	68	70	51	63	61	**64**	44·3	116	$110\frac{15}{16}$	3·242
'99	60	79	53	65	92	58	65	70	**68**	45·1	109	$106\frac{7}{8}$	3·754
1900	62	85	54	69	108	66	71	80	**75**	46·4	95	$99\frac{5}{8}$	3·958
'01	62	85	46	67	89	60	71	72	**70**	44·7	103	$94\frac{1}{4}$	3·721
1902	63	87	41	67	82	61	71	71	**69**	39·6	110	$94\frac{5}{8}$	3·329
'03	62	84	44	66	82	66	69	72	**69**	40·7	101	$90\frac{3}{4}$	3·750
'04	63	83	50	68	81	71	67	72	**70**	43·4	90	$88\frac{1}{4}$	3·292
'05	63	87	52	69	87	72	68	75	**72**	45·7	110	$89\frac{13}{16}$	3·008
'06	62	89	46	69	101	80	74	83	**77**	50·7	112	$88\frac{5}{16}$	4·267
1907	69	88	48	72	107	77	78	86	**80**	49·6	113	$84\frac{1}{8}$	4·925
'08	70	89	48	72	89	62	73	74	**73**	40·1	108	$86\frac{1}{16}$	3·013
'09	71	89	50	73	86	64	76	75	**74**	38·9	113	$83\frac{7}{8}$	3·083
'10	65	96	54	74	89	73	81	81	**78**	40·5	102	$81\frac{3}{32}$	3·725
'11	70	90	61	75	93	76	81	83	**80**	40·4	110	$79\frac{5}{16}$	3·467
1912	78	96	62	81	110	76	82	88	**85**	46·1	97	$76\frac{5}{32}$	3·776
'13	69	99	54	77	111	84	83	91	**85**	45·3	105	$73\frac{21}{32}$	4·771
'14	75	100	58	81	99	81	87	88	**85**	41·6	109	$72\frac{3}{16}$	4·038
'15	108	126	70	107	126	92	109	108	**108**	38·9	106	$65\frac{1}{2}$	5·000
'16	133	152	86	130	158	129	136	140	**136**	51·4	97	$58\frac{1}{80}$	5·470
Average													
1907–16....	81	102	59	84	107	82	88	91	**88**	43·3	106	76	4·127
1890–99....	61	80	63	68	71	56	66	64	**66**	55·8	103	$103\frac{9}{16}$	2·958
'78–87....	79	95	76	84	73	71	81	76	**79**	82·1	97	$99\frac{9}{16}$	3·264
'18–27....	109	90	151	111	128	105	106	112	**111**	98·0	—	—	—

* Silver 60·84*d*. per oz., being the parity of 1 gold to 15½ silver = 100.

† Wheat harvest in U.K. to 1895: 29 bushels = 100; from 1896: 30 bushels = 100.

‡ Average price of Consols and the average Bank of England Rate of discount are actual figures, not index numbers; Consols 3% to 1888, 2¾% from 1889, 2½% from April, 1903.

The combined index number of the forty-five commodities was 136 last year, or 26 per cent. higher than for 1915 when the number was 108, and 60 per cent. higher than in 1914, 1913 and 1912, when for each year the number was 85. It compares with 73 in 1908, following upon the banking crisis in the United States; 69 in 1902–03, and 61 in 1896, the year of lowest prices. Further, it was 36 per cent. *above* the standard period 1867–77, 54 per cent. *above* the average of the past ten years—1907–16—and 106 per cent. *above* the average of the lowest decade on record—1890–99—when the average was 66. The index number of 136 for 1916 contrasts with 111 in 1873, after the Franco-Prussian war, but was still much lower than during the Napoleonic war.

With the exception of a temporary dip in the summer months, the index number of the forty-five commodities rose considerably last year, the number for December having been 154·3 against 118·4 at the end of December, 1915, an increase of 30·3 per cent., while compared with pre-war index number of 81·2 recorded for the end of June, 1914, the rise in prices up to end of December last had been 90 per cent.

The fluctuations in the monthly index numbers during 1916, and the movements in prices since war began, are of particular interest at the present time, and in order to show how these compare with pre-war prices there is given herewith a statement of monthly index numbers for each month from January, 1885, onwards, thus covering the whole period during which these index numbers have been compiled monthly, first by Mr. Sauerbeck until the end of 1912, and subsequently by the *Statist*:—

Monthly fluctuations of the index-numbers of* 45 *commodities*, 1867-77 = 100.

	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
1885	72·3	72·6	72·5	72·5	73·3	72·7	72·2	72·2	71·1	70·4	71·1	70·8	72
'86	70·0	70·5	70·1	69·2	69·1	68·7	68·8	69·1	68·9	68·8	69·8	69·5	69
'87	69·5	68·5	68·3	68·4	68·2	67·9	68·1	68·3	68·2	67·7	69·1	72·4	68
1888	70·9	70·6	69·9	69·8	68·1	67·4	69·0	70·1	71·9	72·4	72·7	73·2	70
'89	72·6	73·5	72·1	72·0	71·4	71·6	72·6	71·4	72·1	72·1	73·7	73·7	72
'90	73·2	72·7	71·5	71·2	70·8	70·5	71·2	72·8	72·2	72·9	71·2	71·1	72
'91	71·1	71·5	71·7	72·4	72·8	71·8	71·6	71·9	71·7	70·7	71·4	71·4	72
'92	70·0	70·0	69·1	68·9	68·8	67·7	67·8	67·4	66·8	67·4	68·2	67·7	68
1893	68·4	69·0	68·1	67·4	67·4	67·4	67·7	67·1	68·2	68·6	67·8	67·0	68
'94	65·8	65·0	64·3	63·8	63·1	63·1	62·6	63·0	62·7	61·7	60·8	60·1	63
'95	60·0	60·0	60·8	61·7	62·5	62·4	62·8	63·3	63·5	63·3	62·3	61·2	62
'96	61·4	61·4	60·7	60·3	60·1	59·3	59·2	59·7	61·3	62·6	62·6	62·0	61
'97	62·0	61·9	61·9	61·5	61·2	61·3	61·7	63·2	63·4	62·7	62·4	62·4	62
1898	62·8	63·4	63·0	65·5	66·4	64·7	64·3	64·0	63·9	63·6	63·9	63·8	64
'99	65·4	65·8	65·6	66·1	66·6	66·9	67·9	68·3	70·0	71·5	71·6	72·3	68
1900	74·0	75·1	75·7	75·6	75·5	75·7	76·2	76·0	75·5	74·7	73·9	73·4	75
'01	72·2	71·7	71·0	70·6	70·5	69·8	69·5	69·8	69·6	69·6	69·0	68·4	70
'02	68·8	68·9	69·2	69·7	70·9	70·4	70·0	69·5	69·3	68·8	68·6	69·1	69
1903	69·5	70·2	70·4	69·4	69·6	69·5	69·5	70·0	69·1	69·0	69·0	70·0	69
'04	70·4	70·8	70·8	70·5	69·9	69·4	69·9	70·4	70·7	71·0	71·2	70·9	70
'05	71·2	71·4	71·8	72·0	71·7	72·0	72·5	72·3	72·4	73·2	74·2	74·9	72
'06	75·2	75·0	75·7	76·5	77·0	76·9	76·4	76·7	77·5	78·5	78·6	79·7	77
'07	80·0	80·7	80·0	80·7	82·4	82·0	81·1	79·4	79·1	78·8	76·7	76·2	80
1908	76·0	74·5	74·1	73·8	73·6	72·9	73·1	72·2	72·5	72·2	72·2	72·3	73
'09	72·0	71·9	72·4	74·3	75·4	75·1	75·2	74·9	74·7	75·2	75·5	76·3	74
'10	77·1	78·1	79·1	78·5	78·2	76·9	78·1	78·2	77·6	77·2	77·8	77·9	78
'11	78·5	78·6	78·9	80·0	80·3	80·0	78·9	79·5	80·3	80·7	80·6	80·9	80
'12	81·8	82·9	84·4	85·0	85·3	85·5	86·5	85·9	86·7	85·8	85·3	86·4	85
1913	86·4	86·4	86·7	86·2	85·7	84·1	84·2	85·0	85·7	84·5	83·3	83·8	85
'14	83·5	83·8	82·8	82·3	82·3	81·2	82·4	87·9	89·3	89·8	88·8	91·6	85
'15	96·4	100·9	103·7	105·9	107·2	106·4	106·4	107·0	107·8	110·0	113·1	118·4	108
'16	123·6	127·0	130·4	134·2	135·4	131·0	130·5	134·5	134·4	141·5	150·8	154·3	136
'17	159·3	164·0	168·4†										

* The twelve monthly figures of each year do not in all cases exactly (at any rate in the decimals) agree with the annual averages, as the latter are partly calculated from revised figures.

† Subject to revision.

The index number of 154·3 at the end of December, 1916, was at a higher level than had been touched for almost a century. Professor Jevons' average number for the year 1818, adjusted in conformity with data subsequently taken out by Mr. Sauerbeck, having been 159. Data relating to index numbers in this country are available from 1782 onwards, and high-water mark was touched in 1809, for which year Professor Jevons' adjusted figure was as high as 189. While it is not suggested that the cost of living, as indicated by the index number of 154·3 at the end of 1916, was higher than ever before, it is probable that at the end of 1916 we were nearer the level of 1809 than the figures of 154·3 and 189, respectively, would appear to indicate. Mr. Sauerbeck's figures of the prices and numbers of forty-five commodities go back to 1846. But prior to that date, and for years as far back as 1818, Mr. Sauerbeck took out the prices of thirty-one commodities, and his statistics show that the index number for 1818 was 142. Of course, the farther one goes back in matters of this kind the less reliable are the comparisons. Many years ago Mr. Sauerbeck endeavoured to make up index numbers for the more important articles before 1818; but he found the result was unsatisfactory, in part because for the first half of last century prices in this country were greatly influenced by protective laws. Further, many articles now of supreme importance were of relatively little importance early in the century: merino wool, cotton, iron and coal, sugar, coffee, and tea, for example. That the index number at the end of December, 1916, should have reached a figure exceeding 154 would have been considered incredible only two or three years ago; but such is the case, and it is a position that this country has to face. The Government have already taken steps to keep prices down; but both their past efforts and those they may put forward in the future must be accompanied by the whole-hearted support of the populace. So long as the war continues, economy in the strictest sense of the word must be introduced if prices are to be prevented from rising still further. And although it does not come within the scope of this review to dwell upon the course of prices during 1917 it is apparent from the statement given above that the cost of living has risen still further since the beginning of the year.

The subject of index numbers is attracting more public attention probably than ever before, and constant inquiries are being made for past data upon the matter. To those desirous of acquiring such information may be commended "Wholesale and Retail Prices," a Board of Trade publication issued in 1903 at the price of 2*s.* 6*d.* Further, a valuable chart showing "The Course of Average Prices of General Commodities in England since 1818" was compiled by Mr. Augustus Sauerbeck, and published by Messrs. P. S. King and Son in 1908 at 1*s.* net.

The greatest rise in average prices last year was in textiles, which advanced 39·4 per cent., chiefly owing to the substantial advance that occurred in the latter part of 1916 in the price of cotton, which at one time touched 12·59*d.* per lb. The average price of middling American cotton last year was about 9*d.* against 5⅞*d.* in 1915.

The greatest rise in average prices during the past three years has been in vegetable foods, which for 1916 were 92·1 per cent. higher than for 1913. Sugar, coffee and tea and sundries were each more than 60 per cent. dearer over the three years; but minerals were only 44 per cent. higher in value, due to the fact that the prices of coal and various other minerals were affected in 1913 by the coal strike of the spring of that year and by other causes. The index numbers for 1916 for the various groups of commodities, compared with similar data for the three previous years, will be evident from the subjoined statement:—

Comparison of War and pre-War annual index numbers.

No. of Articles.		Annual Index numbers.				Increase per cent. 1916 on	
		1916.	1915.	1914.	1913.	1915.	1913.
8	Veg. food ...	133	108	75	69	+22·8	+92·1
7	Animal food ...	152	126	100	99	+21·1	+53·5
4	Sugar, coffee and tea	86	70	58	54	+22·7	+61·2
19	Foodstuffs ...	130	107	81	77	+22·1	+69·3
7	Minerals ...	158	126	99	111	+26·0	+44·4
8	Textiles	129	92	81	84	+39·4	+53·9
11	Sundries ...	136	109	87	83	+25·4	+63·5
26	Materials ...	140	108	88	91	+29·3	+54·1
45	Total	136	108	85	85	+26·3	+59·9

Comparison of prices at the close of 1916 with those at the end of 1915, and just before the outbreak of war, is even more striking, the increase in the index number of the forty-five commodities at the end of December, 1916, against that ruling twelve months earlier having been 30·3 per cent.; while, contrasting the end of December, 1916, number with the number for the end of June, 1914, the rise was no less than 90 per cent. In each case, whether taking the twelve months or the thirty months to December, 1916, the greatest increase occurred in vegetable foods as will be obvious from the following statement:—

Comparison of War and pre-War monthly index numbers.

No. of Articles.		Index numbers.				Increase per cent. December, 1916, on	
		1916 (Dec. 31).	1915 (Dec. 31).	1914 (Dec. 31).	1914 (June 30)	1915 (Dec. 31).	1914 (June 30).
8	Veg. food ...	173·1	117·6	93·2	66·5	+47·2	+160·3
7	Animal food ...	168·7	128·1	104·3	97·5	+31·7	+ 72·6
4	Sugar, coffee and tea	95·0	69·8	63·0	51·8	+36·1	+ 83·4
19	Foodstuffs ...	155·0	111·4	90·9	74·8	+39·1	+107·2
7	Minerals ...	158·9	136·0	99·8	96·7	+16·8	+ 64·3
8	Textiles	150·4	111·7	77·8	80·6	+34·6	+ 86·6
11	Sundries... ..	152·9	123·9	97·7	82·5	+23·4	+ 85·3
26	Materials ...	153·8	123·4	92·1	85·7	+24·6	+ 79·5
45	Total	154·3	118·4	91·6	81·2	+30·3	+ 90·0

The further rise in prices last year was due, in a large measure, to a continued advance in freight rates. This rise in freights was brought about mainly by the action of the British Government in commandeering and requisitioning for war purposes a considerable proportion of the British mercantile marine. The rise in prices was specially noteworthy towards the end of the year when the shortage of tonnage became more pronounced, and when, too, it became increasingly apparent that the world's crops of 1916 were much below those of recent years. The effect of the increase in ocean freights was not confined to the higher prices we paid for imported goods, but brought about corresponding advances in prices of competitive home-made or home-grown goods. Some idea of the advance in ocean freight rates per ton since war commenced will be evident from the statement given below:—

	End of 1916.	End of 1915.	End of 1914.	End of 1913.
	Per ton.	Per ton.	Per ton.	Per ton.
River Plate to U.K.	145/0	120/0	45/0	12/0
Bombay to p.p.	230/0	111/3	22/0	18/0
United States—				
Atlantic Ports to L.H. (cotton)	260/0	262/6	90/0	30/0
Atlantic Ports to U.K. (grain)	74/6	79/0	33/10	7/10
Average	177/4	118/2	47/8	16/11

*Quarterly Movements of Prices.**

Summary of Index Numbers, 1867-77 = 100.

Years.	Quarters.	Vegetable Food (Corn, &c.).	Animal Food (Meat, &c.).	Sugar, Coffee, and Tea.	Total Food.	Minerals.	Textiles.	Sundry Materials.	Total Materials	Grand Total.	Silver.
1896	I	50·4	71·7	62·8	60·8	63·2	55·5	64·5	61·4	61·1	51·1
	II	49·2	71·4	61·2	59·9	62·4	53·7	62·8	59·9	59·9	51·4
	III	50·5	75·2	56·6	60·9	62·2	53·2	62·1	59·4	60·1	50·6
	IV	60·3	74·3	55·2	64·4	65·9	54·1	62·8	60·9	62·4	49·1
1907	I	64·0	88·7	46·7	69·5	112·2	80·0	78·8	88·2	80·2	51·5
	II	69·7	88·7	48·0	72·1	112·6	79·8	80·0	88·7	81·7	50·6
	III	70·1	89·1	49·1	72·7	106·5	76·8	77·5	85·1	79·9	51·9
	IV	73·8	87·0	48·2	73·3	95·9	71·2	76·5	80·1	77·2	43·3
'08	I	71·7	88·9	49·1	73·3	92·0	64·9	73·8	76·0	74·9	42·0
	II	71·1	90·0	50·0	73·7	87·7	62·6	71·7	73·2	73·4	40·3
	III	68·2	90·3	47·2	71·9	88·4	61·7	71·7	73·1	72·6	39·3
	IV	67·8	85·1	47·0	69·8	88·5	61·0	74·3	74·0	72 2	37·7
'09	I	69·3	85·2	48·7	70·8	85·5	60·2	74·4	73·0	72·1	38·5
	II	76·1	91·1	49·6	76·0	84·9	62·8	75·5	74·1	74·9	39·9
	III	70·6	90·6	49·9	73·6	86·5	67·4	75·3	75·9	74·9	39·0
	IV	67·9	88·2	52·8	72·2	88·2	70·3	77·6	78·2	75·7	38·9
'10	I	68·6	95·0	54·6	75·4	90·8	71·4	79·5	80·0	78·1	39·1
	II	64·2	98·8	55·2	75·1	88·1	72·3	80·1	79·9	77·9	40·7
	III	64·6	98·1	53·5	74·6	87·5	72·4	81·7	80·4	78·0	40·5
	IV	63·7	90·6	50·0	70·7	90·1	76·0	82·9	82·7	77·6	41·8
'11	I	65·1	90·1	54·0	72·0	92·2	77·8	82·3	83·6	78·7	39·9
	II	70·1	89·2	55·1	74·0	92·2	82·3	81·3	84·5	80·1	40·3
	III	71·4	88·9	64·7	76·4	92·4	73·9	81·0	81·9	79·6	39·7
	IV	75·7	88·8	69·1	79·2	98·4	69·1	80·7	81·9	80·7	41·5
'12	I	77·8	93·7	67·1	81·4	103·4	72·4	80·7	84·2	83·0	44·1
	II	80·4	98·6	62·6	83·4	107·8	73·9	82·6	86·7	85·3	46·2
	III	77·6	99·2	59·8	81·9	115·0	77·2	82·7	89·7	86·4	47·2
	IV	74·2	93·4	57·8	77·8	116·9	81·0	83·3	91·7	85·8	47·9
'13	I	71·6	101·5	55·7	79·2	113·1	83·0	84·2	91·6	86·4	44 9
	II	71·4	99·1	52·7	77·7	114·4	81·1	83·2	90·9	85·3	45·2
	III	69·3	99·1	52·1	76·6	110·1	85·2	83·2	91·1	85·0	45·6
	IV	65·8	98·7	54·0	75·4	104·8	86·7	83·3	90·1	83·9	44·1
'14	I	66·6	98·7	52·0	75·3	104·4	83·1	84·1	89·3	83·4	43·7
	II	67·0	97·8	51·8	75·2	98·4	82·9	82·5	86·9	82·0	43·4
	III	80·3	102·0	61·5	84·4	96·2	82·4	87·1	88·1	88·1	39·4
	IV	90·1	100·9	63·9	88·6	97·2	77·5	97·2	91·1	90·1	37·1
'15	I	105·0	114·6	66·7	100·8	110·0	85·4	104·2	100·0	100·3	37·9
	II	107·4	129·0	72·5	108·0	121·6	88·5	107·4	105·4	106·5	38·3
	III	104·0	130·5	72·0	107·0	120·8	93·5	109·4	107·1	107·1	37·9
	IV	113·8	123·9	68·7	108·0	131·2	105·5	119·3	118·0	113·8	42·5
'16	I	125·1	137·5	78·9	119·9	150·0	118·1	131·1	132·2	127·0	45·5
	II	127·2	157·0	88·2	130·0	156·2	120·4	135·0	136·2	133·3	54·2
	III	127·9	150·4	85·9	127·4	154·1	127·8	133·5	137·3	133·1	57·3
	IV	163·1	159·8	92·2	147·0	160·1	146·2	147·0	150·3	148·8	57·5

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* The average of the numbers for the four quarters of each year do not agree in all cases with the annual averages, as the latter are partly calculated from revised figures. See also the *Journal*, 1893, p. 221; 1895, p. 144; 1901, p 90; and 1909, p. 70.

† Silver 60·84*d*. per oz. being the parity of 1 gold to 15½ silver = 100.

The quarterly numbers given herewith show the average of the three-monthly figures, and by thus eliminating minor fluctuations they give a more trustworthy comparison of the gradual changes in the various groups of commodities in recent years than is afforded by a contrast of the monthly numbers themselves.

The following figures show in each case the average index numbers of all the forty-five commodities for ten years (see the dotted line in the diagram of the *Journal*, 1886, and also the *Journal*, 1893, p. 220). These give the best picture of the gradual movement of the *average* prices of *whole periods*, as the ordinary fluctuations are still further obliterated :—

1818–27 = 111
'28–37 = 93
'38–47 = 93
'48–57 = 89
'58–67 = 99
'68–77 = 100
'78–87 = 79
'88–97 = 67
'90–99 = 66

1891–1900 = 66
'92– '01 = 66
'93– '02 = 66
'94– '03 = 66
'95– '04 = 67
'96– '05 = 68
'97– '06 = 70
'98– '07 = 71
'99– '08 = 72

1900–1909 = 73
'01– '10 = 73
'02– '11 = 74
'03– '12 = 76
'04– '13 = 77
'05– '14 = 79
'06– '15 = 82
'07– '16 = 88

The decade 1890-99 was the lowest on record more closely calculated, and since then the average has advanced from 66 to 88, or 33 per cent.

Silver.—The silver market was more interesting than for many years, and wide fluctuations in price occurred, ranging from $26\frac{11}{16}$*d.* per oz., on the first working day of the year to $37\frac{1}{8}$*d.* in May. The end of the year quotation was $36\frac{1}{2}$*d.* per oz., and the average of $31\frac{5}{16}$*d.* for the whole year was the highest since the troublous days of the early 'nineties. At the beginning of the year there was a general coinage demand for Allied and Neutral nations, followed in March by large purchases by the Indian Government, especially in China. In April, however, there were almost frenzied demands for the metal, due to competitive buying by the Allied Governments, which undoubtedly would have caused the price to have gone higher had not China made heavy shipments owing to political unrest in that country. Fortunately, an arrangement was made by the Allied Governments whereby competitive sales ceased and the price instantaneously declined. Later the requirements of the Indian Government became more pronounced, a demand sprang up for the United States Mint, sales from China stopped, and at the close of the year India had become a very keen buyer. The stock of silver in London was raised during the year by about 200,000*l.* to 1,000,000*l.* In the Indian Treasury the stock of rupees declined from 2,944 lacs on December 31, 1915, to 1,629 lacs at the close of 1916, while the Chinese stock was reduced from about 62,000,000 oz. to about 24,000,000 oz. Mexico, in a continued state of political chaos, remained a small producer, but in the United States the output was again on a considerable scale.

The world's production of silver, according to compilations made by the *Statist*, has been as follows in recent years:—

World's Production of Silver in Millions of Ounces.

Year.	United States.	Mexico.	Canada.	Australia.*	Other Countries.	Total.
1901	55,2	57,6	5,2	6,3	48,7	173,0
'02	55,5	60,2	4,3	6,4	40,4	162,8
'03	54,3	70,5	4,0	6,5	42,4	167,7
'04	57,7	60,8	3,6	7,8	44,4	164,3
'05	56,1	56,6	5,9	6,8	31,9	157,3
'06	56,5	55,0	8,5	5,6	39,4	165,0
'07	56,5	61,1	12,8	5,9	47,9	184,2
'08 ...	52,4	73,6	22,1	6.5	48,6	203,2
'09	54,7	73,9	27,8	3,7	52,0	212,1
'10	57,1	71,4	33,0	5,2	56,4	222,9
1911	60,4	79,0	32,7	5,7	48,4	226,2
'12 ...	63,7	74,6	31,6	5,2	49,2	224,3
'13	66,8	70,7	31,8	5,9	39,3	224,5
'14	72,4	70,0	27,3	5,5	38,4	213,6
'15	74,9	60,0	26,0	6,0	27,0	193,9
'16	72,9	40,0	25,0	9,0	30,5	177,4

* Local production and excluding silver ore contained in concentrates, &c., exported.

The prices and index numbers were as follows (60·84*d.* per oz. being the parity of 1 gold to $15\frac{1}{2}$ silver = 100):—

	Price per oz. *d.*	Index Number.		Price per oz. *d.*	Index Number.
Average 1873	$59\frac{1}{4}$	= 97·4	*Lowest* Nov., 1902	$21\frac{11}{16}$	= 35·6
,, 1890–99	34	= 55·8	End Dec., 1906 ...	$32\frac{5}{16}$	= 53·1
,, 1907–16	$26\frac{3}{16}$	= 43·3	,, Dec. '08	$23\frac{3}{16}$	= 38·1
,, 1893	$35\frac{5}{8}$	= 58·6	,, Dec. '11	$25\frac{1}{16}$	= 41·2
,, '96	$30\frac{3}{4}$	= 50·5	,, Dec. '12	29	= 47·7
,, '09	$23\frac{11}{16}$	= 38·9	,, Dec. '13	$26\frac{9}{16}$	= 43·7
,, '12	$28\frac{1}{32}$	= 46·1	,, June '14	26	= 42·7
,, '13	$27\frac{9}{16}$	= 45·3	,, Dec. '14	$22\frac{11}{16}$	= 37·3
,, '14	$25\frac{5}{16}$	= 41·6	,, Dec. '15	$26\frac{1}{4}$	= 43·1
,, '15	$23\frac{11}{16}$	= 38·9	,, Dec. '16	$36\frac{1}{2}$	= 60·0
,, '16	$31\frac{5}{16}$	= 51·4	,, Mar. '17	$36\frac{1}{2}$	= 60·0

Gold.—The value of the estimated production in recent years has been as under. The data up to 1912 are those collected by the Director of the U.S. Mint. For subsequent years the *Statist's* estimates are given. In all cases the value is taken at 4·24773*l.* per fine ounce:—

	£		£
1881–85	20,900,000	1909	93,300,000
'86–90	23,100,000	'10	93,500,000
'91–95	33,500,000	'11	97,300,000
'96–1900	52,900,000	'12	96,100,000
1901–05	66,300,000	'13	93,500,000
'06	82,700,000	'14	92,900,000
'07	84,900,000	'15	97,700,000
'08	91,000,000	'16	95,700,000

The average annual *Rates of Discount* current in the three principal European monetary centres during recent years are shown in the following table:—

	London.		Paris.		Berlin.		Average of the Three Markets.	
	Bank Rate.	Market Rate.	Bank Rate.	Market Rate.	Bank Rate.	Market Rate.	Bank Rate.	Market Rate.
	Per cnt.	Per cnt.	Per cnt.	Per cnt.	Per cnt.	Per cnt.	Per cnt.	Per cnt.
1895	2·00	0·80	2·10	1·59	3·14	2·02	2·41	1·47
1900	3·96	3·70	3·25	3·17	5·33	4·41	4·18	3·76
'01	3·72	3·14	3·00	2·48	4·10	3·06	3·61	2·89
'02	3·33	2·96	3·00	2·43	3·32	2·19	3·22	2·53
'03	3·75	3·24	3·00	2·78	3·84	3·01	3·53	3·01
'04	3·39	2·65	3·00	2·19	4·22	3·14	3·50	2·66
'05	3·01	2·61	3·00	2·10	3·82	2·85	3·28	2·52
'06	4·27	3·98	3·00	2·70	5·15	4·04	4·14	3·57
'07	4·92	4·49	3·47	3·40	6·03	5·12	4·81	4·34
'08	3·01	2·23	3·04	2·25	4·76	3·52	3·60	2·67
'09	3·08	2·26	3·00	1·79	3·93	2·87	3·34	2·31
'10	3·73	3·10	3·00	2·44	4·35	3·54	3·69	3·03
'11	3·47	2·89	3·14	2·67	4·40	3·59	3·67	3·05
'12	3·77	3·60	3·38	3·17	4·95	4·22	4·03	3·66
'13	4·77	4·34	4·00	3·88	5·88	5·03	4·88	4·41
'14	4·04	2·88	4·22	—	4·91	3·77*	4·39	—
'15	5·00	3·67	5·00	—	5·00	3·90*	5·00	—
'16	5·47	5·19	5·00	—	5·00	4·57*	5·16	—

* According to German advices and believed to be untrustworthy.

The average rates in 1895 were the lowest on record, those in 1916 the highest since 1873.

Review of the Year.—The great European conflict again dominated economic and political conditions all over the world, and hostilities continued to be prosecuted during the past twelve months with further enormous cost both in life and treasure. Following a great naval fight off the coast of Jutland at the end of

May, the Allies commenced their big offensive on July 1, and by the end of the year were in a much better position than at the close of 1915. During 1916 Roumania entered the conflict on the side of the Allies, but up to the close of the year she had been particularly unfortunate. The Dardanelles enterprise, which had it fructified would probably have completely altered the complexion of the index number quoted above, was abandoned. Chief among the political events of the year was the adoption of compulsory military service in this country, the revival in an acute form of the Irish question in consequence of the rebellion at Easter, the holding of an important economic conference at Paris, and the formation at almost the close of the year of a new Cabinet, designed to improve the machinery of government for the direction of the war. Further, efforts were made to curtail imports, and to introduce economy in the consumption of foodstuffs.

Financially, attention continued to be concentrated upon financing the war, and huge borrowings were made in all the belligerent centres. Beyond having to find the great sum of money needed for her own use, Great Britain supplied her Allies and Dominions with a further 573,000,000*l.* of money, which was included in this country's total expenditure of 2,025,159,000*l.* for the calendar year 1916. On the other hand, this country raised several loans in the United States, though, unlike the Anglo-French Loan of October, 1915, all 1916 emissions were secured upon collateral. No long-term loan was issued by the British Government, and although first of all 5 per cent. Exchequer Bonds maturing in 1919, 1920 and 1921, and subsequently 6 per cent. Exchequer Bonds due February, 1920, were offered, supplemented by the sale of War Savings Certificates (15*s.* 6*d.* per 1*l.* due after five years), and of Two Year War Expenditure Certificates the major part of the borrowing was in the form of Treasury Bills. Indeed, of total borrowings of 1,551,806,000*l.*, no less than 719,606,000*l.* consisted of Treasury Bills, and the new Government which came into power at the close of the year found a total of no less than 1,148,545,000*l.* of these Bills outstanding on December 16. In these circumstances steps were promptly taken to issue a new long-term loan designed to bring in new money and to reduce floating debt. The time available was, however, too short to permit of the measure being carried through before the close of the year. From the sale of 5 per cent. Exchequer Bonds 316,310,000*l.* was received and a further 159,204,000*l.* came in from 6 per cent. Exchequer Bonds. In order to maintain control of the foreign exchanges the British Treasury continued its prohibition of foreign capital issues in this country unless authorized by a Treasury Committee appointed for that purpose. With a further view to regulating neutral exchanges, and particularly the American exchange by reason of the enormous quantities of commodities and munitions of war that we were purchasing, special efforts were made in August whereby under what came to be known as Scheme A British investors in United States railroad and industrial securities and of the bonds and stocks of foreign Governments, municipalities and railways, were invited to deposit their holdings with the Treasury for a certain period. This was quickly followed by Scheme B which was of wider scope and offered still more advantageous terms to holders of the securities sought for than did Scheme A. The deposited securities were used as collateral for the various British note issues made in the United States besides which large blocks of foreign securities were sold outright in the market. The effect of these measures was to maintain the value of the sovereign in New York at par less the cost of remitting gold. During the year 137,000,000*l*. in gold was sent to the United States from all parts of the world in order to provide in part for America's favourable merchandise trade balance of about 618,000,000*l*. The balance of the sum was used by the United States to make loans to various countries to the extent of nearly 300,000,000*l*., and the remainder was employed in purchasing American securities previously held abroad. One feature of the year was the continued heavy decline in the value of the mark, which fell to a discount of over 23 per cent. in New York. Great Britain's store of gold during the year was further reduced by 20,659,000*l*., the imports of gold having been 17,790,000*l*., while the amount exported was 38,449,000*l*., of which the bulk went to the United States. During the year the stock of gold in the Bank of England was raised from 51,102,000*l*. to 54,957,000*l*. The amount of British Currency Notes in circulation rose during the year from 103,125,000*l*. to 150,144,000*l*., while the stock of gold held against them remained unchanged at 28,500,000*l*. Thus the total amount of gold held against the British note circulation increased 3,850,000*l*. Great Britain's trade balance was adverse throughout the year, but was settled by invisible imports, by gold shipments, by the sale of securities and by means of loans in New York and elsewhere. The Bank of England rate, which had stood at 5 per cent. since August 8, 1914, was raised to 6 per cent. on July 13, the ostensible reason for the rise being the protection of the London market against the possible effect of a sudden upward turn in money rates in New York, which, however, proved to be temporary. The effect on the flow of money to London from New York and from other neutral centres was good, and therefore the rise, though regarded by many critics as having been unnecessary, helped to maintain the neutral exchanges which, of course, is a matter of prime importance in financing the war. An interesting new departure was made in the internal affairs of the money market, the Bank of England taking from the clearing banks any money they chose to lend to it. The Bank thus acquired a greatly increased control over the market since it practically established a price below which dealers in credit could not lend.

The depreciation or appreciation in the value of the various currencies as measured by the American dollar is shown by the following statement:—

Rates of Exchange current in New York on the various foreign cities mentioned on December 28, 1916, *and December* 30, 1915.

		Rate December 28, 1916.	Rate December 30, 1915.	Par as usually quoted.	Discount per cent. end of 1916.
New York on—					
London	sight	$4 75 9/16	$4 73 13/16	4. 8666 dollars for 1*l.*....	2·3
,, ...	cables	$4 76 7/16	$4 74½		
,, ...	60 days	$4 71¼	$4 68 15/16		
Amsterdam	sight	40 80 c.	43 5/16 c.	40¼ cents for 1 guilder	Prem. 1·4
Berlin	sight	73 c.	76 5/16 c.	95.28 cents for 4 marks	23·4
Copenhagen	cheques	27 10 c.	27 20 c.	26¾ cents for 1 kronen	Prem. 1·3
Italy...........	sight	6 86½ l.	6 61¼ l.	5.18¼ lire for $1	32·5
Paris	sight	5 84⅝ fr.	5 85½ fr.	5.18¼ francs for $1	12·8
Petrograd	sight	30 25c.	30 c.	51.45 cents for 1 rouble	41·2
Switzerland	sight	5 06 fr.	5 26½ fr.	5.18¼ francs for $1........	Prem. 2·4
Vienna........	sight	11 80c.	13 00 c.	20.26 cents for 1 kroner	41·7

The arithmetical mean of the forty-five index numbers, which was 136 in 1916, 108 in 1915, 85 in 1914, 1913 and 1912, 80 in 1911, 78 in 1910, 74 in 1909, and 80 in 1907, has been subjected to the usual test of using the same index numbers of the separate articles, but calculating each article according to its importance in the United Kingdom on the average of the years 1904-06. In this case the average was 135·7 in 1916, 107·8 in 1915 against 83·6 in 1914, 83·3 in 1913, 83·7 in 1912, 77·7 in 1911 and 1910, 74·9 in 1909, and 77·4 in 1907. It will be seen that on the basis of quantities the ordinary index number, which has to be accepted for general purposes, slightly exaggerates the rise which has taken place, but it is also impossible to give the exact *proportion* of quantities, as they vary from country to country. In the United Kingdom certain heavy goods, such as coal, iron and cotton, also corn, meat and wool, have a preponderating weight if quantities are accepted.

The price movements in recent years of the external trade of this country—total imports into the United Kingdom and exports of the produce and manufactures of the United Kingdom—have been as follows, 1873 being called 111 in accordance with Mr. Sauerbeck's index number for that year (see first table of this review and data given on subsequent pages):—

Year.	Total Imports into United Kingdom and Exports of the Produce and Manufactures of the United Kingdom.			Ratio of Values. 1873 = 111 (1867-77 = 100).	
	Declared Value.	Value at Prices of Preceding Year, according to the *Economist*.	Values at Prices in 1873.	British Trade.	Sauerbeck's and *Statist's* Index Numbers.
	Mln. £'s	Mln. £'s.	Mln. £'s.		
1873	626·0	—	626	111·0	111
'89	675·3	664·5	1,005	74·6	72
'96	681·7	671·5	1,162	65·1	61
1903	833·8	826·5	1,323	69·9	69
'04	852·2	847·0	1,345	70·3	70
'05	895·3	889·6	1,408	70·6	72
'06 ...	983·7	910·9	1,480	73·8	77
'07	1,072·1	1,023·5	1,540	77·3	80
'08	970·4	1,010·1	1,451	74·2	73
'09	1,003·1	1,010·4	1,511	73·7	74
'10	1,109·0	1,057·7	1,593	77·3	78
'11	1,134·8	1,138·9	1,635	77·0	80
'12	1,232·3	1,209·2	1,743	78·5	85
'13	1,294·5	1,271·4	1,798	79·9	85
'14	1,127·7	1,123·4	1,561	80·2	85
'15	1,238·4	1,114·0	1,532	89·2	108
'16	1,455·7	1,162·7	1,447	111·7	136

The third column being based upon uniform prices shows movements of quantities. It has, however, to be remembered that imports of Government stores, etc., have not been included in the Trade Returns since war began. Taking into account published figures only, last year's total was about 5·6 per cent. smaller than in the previous year, and 19·2 per cent. smaller than in 1913. Compared with 1873 there was a total increase of 131 per cent. in volume of the external trade, and since 1896, the year of lowest prices, the expansion was 25½ per cent. The ratio of values (111·7) was considerably lower than either the ordinary index number (136) or the weighted number (135·7).

Construction of the Tabular Statements.

The *Index Numbers* here given are based on the average prices for the eleven years 1867-77, and have been calculated in the ordinary arithmetical way. Take, for instance, the *Gazette* price of English wheat :—

	s.	*d.*	
Average, 1867-77....	54	6	= 100, average point.
,, 1914	35	0	= 64, or 36 per cent. *below* the average point.
,, 1916	58	5	= 107, ,, 7 ,, *above* ,,

The index numbers, therefore, represent simple percentages of the average point.

Certain articles which appear to have something in common have been grouped together, with the following result :—

		1867-77. Total Numbers.	Example for 1916	
			Total Numbers.	Average.
1. Vegetable food, corn, &c. (wheat, flour, barley, oats, maize, potatoes and rice)	8 Index Nos.	800	1,064	133
2. Animal food (beef, mutton, pork, bacon and butter)	7 ,,	700	1,067	152
3. Sugar, coffee and tea	4 ,,	400	345	86
1—3. *Food*	19 ,,	1,900	2,476	130
4. Minerals (iron, copper, tin, lead and coal)	7 ,,	700	1,109	158
5. Textiles (cotton, flax, hemp, jute, wool and silk)	8 ,,	800	1,031	129
6. Sundry materials (hides, leather, tallow, oils, soda, nitrate, indigo and timber)	11 ,,	1,100	1,501	136
4—6. *Materials*	26 ,,	2,600	3,641	140
General average	45 ,,	4,500	6,117	136

The *general average* is drawn from all forty-five descriptions, which are treated as of equal value, and is the simple arithmetical mean as shown above.

*Average Prices of Commodities.**

No. of Article	0	1	2	3	4	5	6	7	8	1—8	9	10
		Wheat.		Flour.	Barley.	Oats.	Maize.	Potatoes.*	Rice.	Vegetable Food.	Beef.‡	
Year.	Silver.†	English *Gazette.*	American.	Town Made white (now "G.R.")	English *Gazette.*	English *Gazette.*	American Mixed.	Good English.	Rangoon Cargoes to Arrive.	Total.	Prime.	Middling.
	d. per oz.	*s.* and *d.* per qr.	*s.* and *d.* per qr.	*s.* per sack (280 lbs.).	*s.* and *d.* per qr.	*s.* and *d.* per qr.	*s.* per qr.	*s.* per ton	*s.* and *d.* per cwt.		*d.* per 8 lbs.	*d.* per 8 lbs.
1873	59¼	58·8	63	51	40·5	25·5	30	160	9·6	—	65	56
'96	30¾	26·2	29	25	22·11	14·9	15	55	6·2	—	45	34
1902	24 1/16	28·1	30·6	26	25·8	20·2	25	69	6·2	—	54	47
'03	24¾	26·9	31	27	22·8	17·2	22	84	7·3	—	48	42
'04	26⅜	28·4	33·6	28½	22·4	16·4	21½	90	6·7	—	48	42
'05	27 13/16	29·8	34	28½	24·4	17·4	23	65	6·9	—	47	40
'06	30⅞	28·3	32·6	26½	24·2	18·4	22	67	7·3	—	47	40
1907	30 3/16	30·7	36	29	25·1	18·10	24½	88	8·3	—	49	42
'08	24⅜	32·7	37·6	31½	25·10	17·10	26¾	81	7·7	—	52	45
'09	23 11/16	36·11	41·6	34½	26·10	18·11	27½	66	7·1	—	52	45
'10	24⅝	31·8	36·6	31	23·1	17·4	23¾	72	7·3	—	54	48
'11	24 9/16	31·8	35	29	27·3	18·10	25¼	87	8·2	—	51	45
1912	28 1/32	34·9	38	32	30·8	21·6	27½	86	10·1	—	56	49
'13	27 9/16	31·9	36·5	30½	27·3	19·1	23⅝	78	8·2	—	54	49
'14	25 5/16	35·0	40·1	33½	27·2	21·0	29¼	71½	9·1	—	56½	52½
'15	23 11/16	53·11	59·10	49	37·4	30·9	41½	93½	13·3	—	72⅛	67⅞
'16	31 5/16	58·5	67·7	52½	51·7	33·5	52¾	153½	16·10	—	81¼	76¾
Average												
1907–16 ...	26⅜	37⅝	42⅞	35	30¼	21¾	30¼	87½	9½	—	57¾	52
1890–99 ..	34	28½	31½	27½	25½	17½	19½	72	6¾	—	47	37½
'78–87...	50	40	43½	34½	31½	21	25	102	8	—	55½	46
'67–77....	58½	54½	56	46	39	26	32½	117	10	—	59	50

Index Numbers (or Percentages) of Prices, the Average of 1867-77 being 100.

Year	0	1	2	3	4	5	6	7	8	1—8	9	10
1873	97·4	108	113	104	104	98	92	137	95	851	110	112
'96	50·5	48	52	54	59	57	46	47	62	425	76	68
1902	39·6	52	54	56	66	78	77	59	62	504	92	94
'03	40·7	49	55	59	59	66	67	72	72	499	81	84
'04	43·4	52	60	62	57	63	66	77	66	503	81	84
'05	45·7	55	61	62	62	67	71	56	67	501	80	80
'06	50·7	52	58	58	62	70	68	57	73	498	80	80
1907	49·6	56	64	63	64	72	75	75	82	551	83	84
'08	40·1	59	67	69	66	69	82	69	76	557	88	90
'09	38·9	68	74	75	69	73	85	56	71	571	88	90
'10	40·5	58	65	67	59	67	73	62	72	523	92	96
'11	40·4	58	63	63	70	72	78	74	82	560	87	90
1912	46·1	64	68	70	79	83	85	74	101	624	95	98
'13	45·3	58	65	66	70	73	73	67	82	554	92	98
'14	41·6	64	72	73	70	81	90	61	91	602	96	105
'15	38·9	99	107	106	96	118	128	80	132	866	122	136
'16	51·4	107	121	114	132	128	163	131	168	1064	138	154

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* The annual prices are the average monthly or weekly quotations, except potatoes, which are the average weekly quotations during the eight months January to April and September to December.

† Index numbers of silver as compared with 60·84*d.* per ounce being the parity between gold and silver at 1 : 15½; not included in the general average.

‡ Meat (9—13), by the carcase, in the London Central Meat Market.

Average Prices of Commodities—Contd.

No. of Article	11	12	13	14	15	9—15	16A	16B	17	18A*	18B*	18
	Mutton.		Pork.	Bacon.	Butter.		Sugar.			Coffee.		
Year.	Prime.	Mid-dling.	Large and Small, Average.	Water-ford.	Fries-land, Fine to Finest.	Animal Food. Total.	British West Indian Refining	Beet, German, 88 p. c., f.o.b.	Java, Floating Cargoes.	Ceylon Planta-tion, Low Mid-dling.†	Rio, Good.	Mean of 18A and 18B.
	d. per 8 lbs.	*d.* per 8 lbs.	*d.* per 8 lbs.	*s.* per cwt.	*s.* per cwt.		*s.* per cwt.	*s.* per cwt.	*s.* per cwt.	*s.* per cwt.	*s.* per cwt.	
1873	71	63	54	81	123	—	22½	25	28	100	86	—
'96	53	39	35	50	98	—	10¾	10½	12½	95	58	—
1902	55	44	48	63	102	—	7¼	6¾	8½	70	31	—
'03	58	47	44	60	100	—	8½	8¼	9¾	70	30	—
'04	59	50	39	57	102	—	10¼	10¼	11½	75	37	—
'05	59	51	46	65	107	—	11	11¼	12¾	75	40	—
'06	60	53	49	65	110	—	8½	8⅝	10	75	39	—
1907	60	54	45	63	108	—	9	9½	10⅞	75	31	—
'08	58	52	43	62	114	—	9¾	10½	11½	66†	31	—
'09	52	46	49	71	112	—	10¼	11	12¼	70	35	—
'10	58	52	54	75	114	—	11	12¾	13¼	69	42	—
'11	55	49	46	66	121	—	11½	13	14	83	58	—
1912	59	54	50	69	123	—	11	12¼	13⅜	87	66	—
'13	62	56	55	77	119	—	9½	9½	10⅞	81	53	—
'14	64	57½	49	75¾	120	—	11¾	12⅛	13⅝	79	45	—
'15	75⅛	69¾	72	93¼	141	—	14⅜	17⅛‡	18¾	78½	43½	—
'16	93½	86½	87¾	109¾	191	—	21¼	22¾‡	26½	77¾	50	—
Average												
1907-16 ...	63½	57½	55	76¼	126¼	—	12¼	13	14½	76⅝	45½	—
1890-99....	54½	41½	42½	59	100	—	11½	11½	13¾	98	62	—
'78-87....	64½	53	49	71	116	—	17	18	21½	78	52	—
'67-77....	63	55	52	74	125	—	23	24	28½	87	64	—
	Index Numbers (or Percentages) of Prices, the Average of 1867-77 being 100.											
										*	*	
1873	113	114	104	109	98	760	101		98	115	134	125
'96	84	71	67	68	78	512	46		44	109	91	100
1902	87	80	92	85	82	612	30		30	80	48	64
'03	92	85	85	81	80	588	36		34	80	47	63
'04	94	91	75	77	82	584	44		40	86	58	72
'05	94	93	88	88	86	609	47		45	86	62	74
'06	95	96	94	88	88	621	36		35	86	61	73
1907	95	98	87	85	86	618	39		38	86	48	67
'08	92	95	83	84	91	623	43		40	76	48	62
'09	83	84	94	96	90	625	45		43	80	55	67
'10	92	95	104	101	91	671	51		47	79	66	72
'11	87	89	88	89	97	627	52		49	95	91	93
1912	94	98	96	93	98	672	49		47	100	103	102
'13	99	102	105	104	95	695	40		38	93	83	88
'14	102	105	94	102	96	700	50		48	91	70	81
'15	119	127	138	125	113	881	67		66	90	68	79
'16	148	157	169	148	153	1,067	100		93	90	78	84

* Index numbers not included in general average.

† East India good middling from 1908.

‡ Comparative values.

Average Prices of Commodities—Contd.

No. of Article	19A*	19C*	19B*	19	16—19	1—19	20A	20B	21	22	—	23
	Tea.						Iron.			Copper.		Tin.
Year.	Congou, Common. *d.* per lb.	Indian Good Medium. *d.* per lb.	Average Import Price. *d.* and dec. per lb.	Mean of 19A and 19B.	Sugar, Coffee, and Tea. Total.	Food. Total.	Scottish Pig. *s.* and *d.* per ton	Cleveland (Middlesbrough) Pig. *s.* and *d.* per ton	Bars, Common. £ per ton	Chili Bars. £ per ton	English Tough Cake. £ per ton	Straits. £ per ton
1873	12	—	16·67	—	—	—	117·3	—	12½	84	92	132
1896	4	7½	9·55	—	—	—	46·10	38·2	5	47	50	60
1902	3¾	5¾	7·20	—	—	—	54·6	49·3	6⅛	53	57	121
'03	4¼	6½	7·71	—	—	—	52·3	46·3	6¼	58	62	127
'04	5	6⅜	7·24	—	—	—	51·5	43·3	6⅛	59	63	127
'05	4¼	5¾	7·24	—	—	—	53·6	49·6	6½	70	74	143
'06	4	5¾	7·40	—	—	—	58·9	53·0	7¼	88	92	181
1907	5¼	7	8·13	—	—	—	63·6	55·7	7½	87	92	172
'08	5¼	6⅞	7·96	—	—	—	56·1	50·5	6¾	60	64	133
'09	5	7⅛	8·16	—	—	—	55·1	49·3	6½	59	62	135
'10	4½	7¼	8·23	—	—	—	56·1	50·1	6½	57	61	155
'11	5¼	8½	9·00	—	—	—	53·5	47·3	6⅜	56	60	191
1912	5⅜	8¼	8·78	—	—	—	64·2	58·2	7⅜	73	78	210
'13	5	8¼	9·06	—	—	—	65·6	58·3	7¾	68	73½	201
'14	6	8⅝	9·19	—	—	—	57·1	51·0	7	59½	64½	151
'15	8⅜	10½	11·01	—	—	—	71·2	65·2	10½	72¾	82½	164
'16	8	10¾	11·29	—	—	—	90·0	84·0	13¾	115¾	134	182
Average												
1907–16....	5¾	8¼	9¾	—	—	—	63¼	56⅞	8	70⅜	77⅛	169⅜
1890–99...	4⅝	7½	9¾	—	—	—	47	41½	5½	50	53	81
'78–87....	6¾	—	12¾	—	—	—	46	38	5½	55	60	89
'67–77....	11¼	—	17¼	—	—	—	69	60	8¼	75	81	105
	Index Numbers (or Percentages) of Prices, the Average of 1867-77 being 100.											
	*		*									
1873	107	—	97	102	426	2,037	170	—	152	112	—	126
1896	36	—	56	46	236	1,173	68	—	61	63	—	57
1902	33	—	42	38	162	1,278	79	—	74	71	—	115
'03	38	—	44	41	174	1,261	76	—	76	77	—	121
'04	44	—	42	43	199	1,286	74	—	74	79	—	121
'05	38	—	42	40	206	1,316	80	—	79	93	—	136
'06	36	—	43	40	184	1,303	86		88	117	—	172
1907	47	—	47	47	191	1,360	92		91	116	—	164
'08	47	—	46	46	191	1,371	82		82	80	—	127
'09	44	—	47	46	201	1,397	81		79	79	—	129
'10	40	—	48	44	214	1,408	82		79	76	—	148
'11	47	—	52	50	244	1,431	78		77	75	—	182
1912	48	—	51	50	248	1,544	95		89	97	—	200
'13	44	—	52	48	214	1,463	96		94	91	—	191
'14	53	—	53	53	232	1,534	84		85	79	—	144
'15	74	—	64	69	281	2,028	106		128	97	—	156
'16	71	—	65	68	345	2,476	135		166	154	—	173

* Index numbers not included in the general average.

Average Prices of Commodities—Contd.

No. of Article	24	25A	25B	26	20—26	27	28	29A	29B	30A	30B	31
	Lead.	Coal.				Cotton.		Flax.		Hemp.		Jute.
Year.	English Pig.	Wallsend Hetton in London.	New-castle Steam.	Average Export Price.	Minerals. Total.	Middling American.	Fair Dhollerah.	Petrograd.	Russian, Average Import Price.	Manila Fair Roping.	Petrograd Clean.	Good Medium.
	£ per ton	*s.* per ton	*s.* per ton	*s.* and dec. per ton		*d.* per lb.	*d.* per lb.	£ per ton	£ per ton	£ per ton	£ per ton	£ per ton
1873	23½	32	—	20·90	—	9	6 3/16	47½	44	43	36	18
'96	11½	15½	8	8·85	—	4 11/32	3 3/32	26	27	17½	25	12¼
1902	11⅜	18½	11¼	12·29	—	4 27/32	3 11/16	32	37	43	27	12¼
'03	11¾	16½	10½	11·70	—	6·03	4⅛	32	36	36	27	13½
'04	12¼	16¼	9½	11·13	—	6·60	5	36	38½	38	28	14
'05	14¼	15½	9¼	10·56	—	5·09	4 5/32	32	35	39½	29	18½
'06	17½	16½	10½	10·90	—	5·95	4 13/16	33	37	41½	31	23½
1907	19½	19¾	14½	12·75	—	6·55	4 7/16	30	34	35	31	21
'08	13⅞	18	12	12·77	—	5·72	4 5/16	23	29½	24½	28	15½
'09	13½	17½	11	11·30	—	6·33	4⅞	28	32½	24½	28	13
'10	13¼	17¼	10½	11·72	—	8·00	6	35	37	23	30	14¾
'11	14⅜	17¾	10⅞	11·43	—	7·04	6	37	43½	20	33	20¼
1912	18¼	21¾	14¾	12·70	—	6·45	5 5/16	36½	40½	26	37	21
'13	19⅛	21½	15½	13·94	—	7·01	5 11/16	34	41¼	31¾	38	26½
'14	19¼	21¼	14⅛	13·65	—	6·41	4 9/16	33	38	26¾	43	27⅛
'15	24	30¾*	21⅛	16·96	—	5·87	4⅜	59¾	66⅜	41⅛	60½	21⅛
'16	32½	27½*	41¼	24·64	—	9·00	7	76¾	85¼	54¾	71	31
Average												
1907-16....	18¾	21¼	16½	14¼	—	6⅞	5¼	39¼	44⅛	30¾	40	21⅛
1890-99....	12	17½	10⅜	10⅜	—	4¼	3	27	27½	26½	25	12½
'78-87....	14	16¾	8⅝	9	—	6	4¼	33	34	35½	26½	15
'67-77...	20½	22	12½	12½	—	9	6¾	46	48	43	35	19

Index Numbers (or Percentages) of Prices, the Average of 1867-77 being 100.

Year	24	25A	25B	26	20—26	27	28	29A	29B	30A	30B	31
1873	117	145	—	167	989	100	92	97		101		95
'96	56	68	—	71	444	48	46	56		55		64
1902	55	84	—	98	576	54	55	74		90		64
'03	57	75	—	94	576	67	61	72		81		71
'04	60	74	—	89	571	73	74	79		85		74
'05	70	70	—	84	612	57	62	71		88		97
'06	85	75	—	87	710	66	71	74		93		124
1907	95	90	—	102	750	73	66	68		85		111
'08	68	82	—	102	623	64	64	56		67		82
'09	66	80	—	90	604	70	72	64		67		68
'10	65	78	—	94	622	89	89	77		68		78
'11	70	81	—	91	654	78	89	86		68		107
1912	89	99	—	102	771	72	79	82		81		111
'13	93	98	—	112	775	78	84	80		89		140
'14	95	97	—	109	693	71	67	76		89		143
'15	117	140	—	136	880	65	64	134		130		111
'16	159	125	—	197	1,109	100	104	172		161		163

* Approximate prices.

Average Prices of Commodities—Contd.

No. of Article	32A	32B	33	34	27—34	35A	35B	35C	36A	36B	37
	Wool.			Silk.		Hides.			Leather.		Tallow.
Year.	Merino Port Phillip Average Fleece	Merino, Adelaide, Average Grease.	English, Lincoln Half Hogs.	Tsatlee.	Textiles. Total.	River Plate, Dry.	River Plate, Salted.	Average Import Price.	Dressing Hides	Average Import Price.	Town.
	*d.** per lb.	*d.* per lb.	*d.* per lb.	*s.* per lb.		*d.* per lb.	*d.* per lb.	*d.* and dec. per lb.	*d.* per lb.	*d.* per lb.	*s.* per cwt.
1873	25	11¾	24½	21¾	—	11	8¼	—	18¼	—	44
'96	13	6⅜	11½	10½	—	6¾	5½	4·89	13½	13⅛	21
1902	15	7⅝	6¼	11	—	7⅝	6⅜	5·52	14	14½	32½
'03	16	8¼	7¼	13½	—	8	6½	5·75	14	15½	29½
'04	16	8	10⅛	12½	—	8¼	6¾	5·66	14	15	26½
'05	17¼	8¾	12⅜	12¾	—	9	7¼	5·98	14	15¼	26½
'06	18	9¼	13⅜	13¾	—	10	7¾	6·52	16½	16	30½
1907	18	9⅜	12¼	15¼	—	9¾	7⅝	6·98	16	17⅞	34½
'08	15¾	7⅞	8½	10½	—	8¼	5⅞	6·30	14½	17¼	30½
'09	17¾	9¼	9	9¾	—	9¼	7	6·73	15	17¼	30½
'10	18¼	9⅝	9⅞	10¼	—	9¾	7⅝	7·15	16	17½	35½
'11	17¼	8¾	10	10⅞	—	9¾	7½	7·17	17	17¼	33½
1912	17½	9¼	10½	10⅝	—	10½	8⅜	7·51	17½	17½	33
'13	18	9½	12⅜	11	—	12⅜	9½	8·62	19½	19¼	34⅜
'14	18½	9⅜	12⅝	10⅞	—	13⅛	9½	9·11	21⅛	19¾	31½
'15	21⅜	10⅞	17⅜	9 13/16	—	13	11	10·04	28⅝	21¾	36⅜
'16	32¾	16½	20	16¼	—	14¾	13¼	11·70	28½	27	46¾
Average 1907-16....	19½	10	12¼	11½	—	11	8¾	8⅛	19⅜	19¼	34⅝
1890-99....	13½	6½	10	11½	—	6¼	5½	5	13¼	13¾	25
'78-87 ...	18½	8⅜	11¾	15	—	8⅝	6¾	6½	15	17	35½
'67-77....	21¼	9⅞	19¾	23	—	9	7	6⅞	16	18¾	45

Index Numbers (or Percentages) of Prices, the Average of 1867-77 being 100.

Year	32A	32B	33	34	27—34	35A	35B	35C	36A	36B	37
1873	118	—	124	95	822	120	—	—	114	—	97
1896	62		58	46	435	77		—	84	—	77
1902	72		32	48	489	87		—	87	—	72
'03	78		37	59	526	91		—	87	—	65
'04	77		51	54	567	94		—	87	—	59
'05	84		63	55	577	95		—	84	—	59
'06	87		68	60	643	103		—	94	—	68
1907	88		62	66	619	105			97		77
'08	76		43	45	498	90			91		68
'09	87		46	42	516	100			93		68
'10	90		51	45	587	106			96		79
'11	83		51	47	609	106			99		74
1912	86		53	46	610	114			101		73
'13	88		63	48	670	133			112		76
'14	90		64	47	647	139			118		70
'15	104		88	43	739	149			145		81
'16	159		101	71	1,031	174			160		104

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* Port Phillip fleece washed nominal since 1895, exactly in proportion with the value of clean wool

Average Prices of Commodities—Contd.

No. of Article	38	39	40A	40B	41	42	43	44	45A	45B	35—45	20—45	1—45
	Oil.			Seeds	Petroleum.*	Soda.		Indigo.	Timber.				
Year.	Palm. £ per ton.	Olive. £ per tun.	Linseed. £ per ton.	Linseed. s. per qr.	Refined. d. per gall.	Crystals. s. per ton	Nitrate of Soda. s. per cwt.	Bengal, Good Consuming. s. per lb.	Hewn, Average Import Price. s. per load.	Sawn or Split, Average Import Price. s. per load.	Sundry Materials. Total.	Materials. Total.	Grand Total.
1873	38	43	32	62	15¼	100	15½	6¾	65	62	—	—	—
'96	22	30	17½	33	5½	42	8	4¼	40	44	—	—	—
1902	27½	34	28	50	6¼	64	9¾	3¼	39	51	—	—	—
'03	28	33	21	39	6¼	64	9¾	3¼	39	54	—	—	—
'04	27½	32	16	33	6⅛	64	10¼	2⅞	36	51	—	—	—
'05	27	36	18	39	5⅝	64	11	2⅞	38	51	—	—	—
'06	30½	39	20¾	43	6⅛	64	11¼	3	40	55	—	—	—
1907	33	43	23½	44	6¾	64	11¼	3¼	40	57	—	—	—
'08	27½	43	22¼	45	6¾	61	10½	3⅜	36	53	—	—	—
'09	29	50	24¾	49	6⅜	61	10¼	3¼	34	54	—	—	—
'10	35	47	38½	66	6	61	9¾	3⅛	36	57	—	—	—
'11	34½	50	42¼	70	5⅜	57	10	3	38	57	—	—	—
1912	33	48	35¼	60	8¼	53	11¼	2¾	41	60	—	—	—
'13	35¼	49½	24¾	45½	8½	47½	11½	2¾	40	63	—	—	—
'14	37¾	50¾	24⅞	48⅝	7 9/16	47½	10⅞	5¾	41¾	64½	—	—	—
'15	34 11/16	51⅞	30⅛	57⅜	8 15/16	48⅜	12⅝	13⅜	58⅞	94¼	—	—	—
'16	44½	59¼	41¼	80¼	12	78¾	17⅞	13⅜	82⅛	148½	—	—	—
Average													
1907–16....	31⅜	49¼	30¾	56½	7⅝	58	11½	5⅜	44¾	70¾	—	—	—
1890–99...	24½	35	19¼	38	5⅛	53	8¼	4⅜	40	45	—	—	—
'78–87....	32½	40	23	46	6⅞	62	12½	6	47	47	—	—	—
'67–77....	39	50	30	60	12½*	92	14	7¼	60	54	—	—	—
	Index Numbers (or Percentages) of Prices, the Average of 1867-77 being 100.												
1873	97	86	105		* 122	109	110	92	111		1,163	2,974	5,011
'96	56	60	56		44	46	57	59	74		690	1,569	2,742
1902	71	68	87		50	70	70	45	79		786	1,851	3,129
'03	72	66	67		50	70	70	45	82		765	1,867	3,128
'04	71	64	54		49	70	73	40	76		737	1,875	3,161
'05	69	72	63		45	70	79	40	78		754	1,943	3,259
'06	78	78	71		49	70	80	41	83		815	2,168	3,471
1907	85	86	75		54	70	80	45	85		859	2,228	3,588
'08	71	86	75		54	66	75	46	78		800	1,921	3,292
'09	74	100	82		51	66	73	45	77		829	1,949	3,346
'10	90	94	116		48	66	70	43	82		890	2,099	3,507
'11	88	100	125		43	62	71	41	83		892	2,155	3,586
1912	85	96	106		66	58	80	38	89		906	2,287	3,831
'13	90	99	78		68	52	82	38	90		918	2,363	3,826
'14	84	101	82		61	52	78	80	93		958	2,298	3,832
'15	89	104	97		71	53	90	184	134		1,197	2,816	4,844
'16	114	119	135		96	86	128	183	202		1,501	3,641	6,117

* Petroleum as compared with the average from 1873-77 only.

REVIEWS OF STATISTICAL AND ECONOMIC BOOKS.

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1.—*Criminality and Economic Conditions.* By W. A. Bonger. Translated by H. O. Horton. 706 pp., 8vo. London: Wm. Heinemann. Price 21*s.* net.

This book is a translation from the Dutch, prepared under the auspices of the American Institute of Criminal Law and Criminology, a body which has arranged for the translation of a number of foreign publications on criminology. The plan of the book is, firstly, to give a summary, with extracts, of the principal previous writers, some sixty in number, beginning with Sir Thomas More, grouped according to the various "schools"—Statisticians, Italian, French, Bio-Socialists, &c., with critical commentaries (246 pages). Part II, Book I, discusses the present economic system from the standpoint of a thoroughgoing follower of Marx (pages 247 to 376). Book II sets out the author's view of the causes of crimes of various kinds, more especially those grouped as "economic" and as crimes of "vengeance."

As an introduction to the various discussions and controversies on crime, Part I is certainly to be commended as a painstaking and useful achievement. The criticism is, however, marred by a rather strong desire always to show that environment is the one and only thing that matters. Readers would have been saved some trouble and repetition of arguments might have been avoided if the author had made it clear once for all at the beginning that the real truth is that he is not interested in the question of hereditary inborn qualities. He explains on page 534 that he accepts it as indisputable that natural mental and moral qualities vary according to some "curve of error," much as the stature of individuals varies, and that people are therefore in varying degrees lacking in moral force, or possessed of exceptionally egoistic natures, &c. He does not give very much attention to analyses of these positive and negative defects, however, because his point of view is that for sociology "the task that is incumbent on it is to explain why "individuals who, as a consequence of their innate qualities, run "more danger than others of becoming criminals, actually become "so." If out of 100 people living in poor circumstances a few become criminals, Dr. Bonger will not have us say that their inborn defects are the cause of their criminality. He insists on saying that if they had not had a bad environment most of these few would not have become criminals, only a comparatively few pathological cases would continue to occur if social conditions were perfected; and therefore social conditions are the cause of crime. The author exhibits freely the rather tiresome habit, often noticeable in Continental works, of overdoing and repeating didactic arguments of a kind which Marshall has likened to discussions as to which side of a pair of scissors does the cutting—one "school" insisting on the one side and the other "school" on the other side, when plainly it is the conjunction and interaction of the two. Crime is the result of the interactions of "nature" and "nurture" and it is profitless to try to insist on saying that one is the "cause" to the exclusion of the other. This attitude does not assist in making the most judicious use of statistical data. Where the causes in operation are so complex and the data imperfect an anxious desire to avoid bias is essential to enable one to draw deductions safely. The author is so anxious, however, to find in "capitalism" the root of all evil that he rather weakens a good case in criticizing those who have made too much of the theory of criminality as an inherited characteristic. One rather infers that the main purpose of the book is to provide an additional argument for the abolition of private property rather than to discover how criminality can be diminished. Inferentially it seems to be admitted that improvements of social conditions have occurred and crime has diminished under conditions of capitalistic industry, but as an unusually thoroughgoing Marxian the author seems unwilling to interest himself much in mere ameliorations; and this makes the book distinctly weak on the subject of practical remedies, short of some vague economic revolution.

The statistical data do indicate, as might be expected, that criminals are drawn mainly from classes in which poverty and poor education prevail, and that seems to the author to prove his thesis, since he believes himself to have shown by the Marxian economics that capitalism necessarily produces poverty. He might well, in a study of criminology, have omitted the Marxian theory altogether. It is one thing to show that poverty and ignorance produce crime. It is an entirely different question whether "capitalism" is the cause of poverty. It would have been more useful and more interesting if the learned author had devoted more space to a critical examination of the many instances in which poverty and crime fail to be correlated, instead of reiterating his Marxian dogmas. Why, for instance, is there so much less crime in rural districts generally than in industrial districts? In some cases there may be more poverty and more contrasts between rich and poor in the latter than in the former, but it is not always the case. In the southern agricultural counties of England, as compared with mining districts, wages are lower, hours of work longer, contrasts between rich and poor greater, and both kinds of districts are equally "capitalistic." Yet there is much less crime in the agricultural than in the mining districts. It is evident that no simple generalisations are satisfactory. A factor which the author overlooks, but which appears to be of importance, is the mere effect of agglomeration into large communities, quite apart from excessive poverty. Such agglomeration enables birds of a feather to flock together and enables a man, if he so chooses, to become lost in the crowd. That must be a condition much more favourable to crime than life in a rural village. C.F.B.

2.—*A Brief History of Panics and their Periodical Occurrence in the United States.* By Clement Juglar. Third Edition, translated and edited with an Introduction and brought down from 1889 to date by De Courcy W. Thom. ii + 189 pp., 8vo. New York and London: G. P. Putnam's Sons, 1916. Price $1 net.

Mr. Thom has extracted from M. Juglar's *Des Crises Commerciales et de leur Retour Periodique en France, en Angleterre, et aux Etats Unis* the chapters relating to the United States. M. Juglar brought his sketch of transatlantic financial history down to 1889, and Mr. Thom has continued it and has given in an Introduction a condensation of M. Juglar's general theory of panics. The new matter in this edition begins with the panic of 1893–94, which was due to the silver currency trouble and includes the panic of 1903 caused by the "trust busting" campaign, that of 1907 which was a panic of credit, and that of 1913 which ended a period of brisk trading. Of these only the first is treated at all fully, while that of 1903 was surely due more to the speculation incident to the trust-forming boom of 1899-1901 than to the efforts of the people to free themselves from plutocratic control. The panic of 1907 may have been aggravated by the efforts of the railways to find capital at a time when the legislature was trying to make them a really public service, but probably the fundamental cause was the bad banking system of the United States, and this Mr. Thom quite fails to bring out. The crisis of 1913 was the natural outcome of the preceding boom which ended, as booms do, in high prices, overtrading, and collapse. President Wilson's reform of the banking system enabled order to be speedily restored. Since then has come the war boom, "and "that the American people has not been forced through entrance "into the 'World War' to deplete their reserve strength, especially "in a financial way, is due to the splendid conduct of our great "President." After the war "will come a readjustment of our "trade. Money will have become actually or potentially scarce "because of the previous vast expansion of our business, and all "the banking power of our country will be requisite to prevent a "crashing panic." The casualties will be greater than in 1913, "for the volume of business involved at present is vastly more "swollen and the kind more circumscribed." How far America's actual entrance into the war will affect this prophecy is as doubtful as the prophecy itself. Sixteen panics in all are discussed in this book, covering a period of a hundred years. Ten fall within the first eighty and six within the last twenty years—not much support for the theory of cycles. H.W.M.

3.—*Financial Chapters of the War.* By Alexander Dana Noyes. xi + 255 pp., 8vo. New York: Charles Scribner's Sons, 1916. Price $1.25.

To *know* how "others see us" has most of the advantages of "*seeing* ourselves as others see us," but it is immensely superior when a sound judgment of the whole matter is required. It is true that the outsider sees most of the game, but he does not always know who has been playing at the top of his form, nor why the bowling was changed. With Mr. Noyes' well-informed and illuminating criticism of our financial operations and position during the past three years in front of him the average British reader interested in these problems must certainly feel that a new light is thrown upon many difficult matters. It is beyond all question a readable and interesting work and gives at the same time a clearer insight into the American mind and ambition than perhaps the author realized. He admits that the American financial prophet was just as wrong as any other—hence, no doubt, his caution and reserve when he himself assumes the rôle. In his description of actual occurrences he sometimes gives us a surprise: the "run" on the Bank of England on the Saturday before the war is certainly exaggerated or misjudged, and in another place he seems to think that the Government seriously considered the suspension of "gold payments," as though that were the *raison d'être* of a suspension of the Bank Act. His statement that "out of all profits from manufacture of war "material the Government was to take one-half in taxes" is wrong, both as to the scope of the Excess Profits Duty and its amount. But half a dozen such blemishes count for little against the general excellence and shrewdness which characterize the work. The analysis of the position of the Stock Exchanges at the beginning of the war is most interesting, and it is explained why the New

York Exchange was compelled to follow London in shutting down "despite the previous night's formal decision to the contrary." The action of the Government in coming behind the bills of exchange is rightly given an important place—it was no doubt the key to the whole situation. When the question of economic exhaustion is touched, the author justly remarks that the teaching of history shows that Governments can fight on, often against seemingly overwhelming military odds, "long after the puzzle has become inscrutable" how they can continue to maintain credit and feed the population. England's achievements in taxation are very favourably contrasted with Germany's methods, and, indeed, in most questions of finance this then "neutral" critic awards the palm to Britain. Very graphically he describes the early financial difficulties of the States and the subsequent unprecedented boom in industry. There is, of course, a natural pride in the industrial expansion, but some misgiving as to the position of the United States after the war. Although we have the author's full sympathy in all the moral issues of the conflict, he is not wholly free from that ambition for financial pre-eminence which America's neutrality might gain for New York and which the rather premature celebration of London's "loss in "economic prestige" has made us feel cynical about at times. In prophecy Mr. Noyes is naturally guarded, as becomes the annalist of unfulfilled forecasts, but he commits himself to the view that Britain will not embark upon the "suicidal policy" of complete exclusion of German trading with the inevitable recourse to American producers, and thus it seems that he does not take our adhesion to the Paris proposals very seriously. J.C.S.

4.—*How to pay for the War : being ideas offered to the Chancellor of the Exchequer by the Fabian Research Department.* Edited by Sidney Webb. 278 pp., 8vo. George Allen and Unwin, Ltd., London.

Mr. Sidney Webb names six persons who have co-operated with him in the actual production of this work, but he also refers to a large number in different branches of administration who have given assistance upon particular points. It is probably true to say that no single writer unaided would have been able to produce a work so wide in range and at the same time so detailed and precise in information and prolific in suggestion. It is not a contribution to the immediate problem of raising funds to pay for the war, but deals with the after-war legacy of debt and the means to increase the receipts of the National budget. Broadly, of course, it is a plea for increased collectivist activity, and the elimination of the waste and muddle due to private competition ; and as such it is probably the most reasoned and practical treatise that has been offered to British statesmen. The times are as ripe as they have ever been, with the most ardent individualists of a few years ago clamouring for state action, compulsion, strong men and dictators, and one must look far for any who will thrill with indignation at the suggestion of railway nationalization, coal nationalization, or national insurance. Mr. Webb has eloquent chapters upon the shortcomings of the Post Office and the Income Tax—two departments that have been under State control throughout—but probably no one will gibe at the inconsistency of including them in a volume which is advocating a wide extension of State control. The main proposition here is that "instead of taxing production more than at "present, we should meet the burdens of the war by untaxing it," and by taking over the great services of communication and coal-power relieve and promote industry while absorbing profit for the State. If there is one weakness in this work it is that there is perhaps too little discussion of abstract principle. A roseate future is outlined for a progressive Post Office that will lend its organization for all the odds and ends of Government, and become the common carrier, banker, debt collector, investing agency, international remittance market, newspaper agent and bookseller—for nearly all of which by selection from the special features of postal systems abroad some precedent can be found—but it is by no means clear how far common convenience is to be studied as distinct from profitability. There must be many activities which would give a profit in most favourable spheres which would be unprofitable on balance after supplying the desert places, and yet universality is of the essence of these proposals; Muddleton Parva would stand no denial of its newspapers because of its poor population, and yet a uniform rate that would be equal to cost of service over all might well be unable to compete with intelligent organization in populous centres. The claims of cost of service compared with maximum yield as the guiding principle of State Government in this matter would have to be more fully worked out before the alluring prospect here set out could be relied upon, and it is not clear that the virtues peculiar to each have not sometimes been promised in this prospectus. But no one can deny that even within its present admitted range of activity, there are many useful and practicable suggestions here set forth for the British Post Office. It may be true, as claimed, that an increase in the variety of business means a rise in the "load "factor," and thus a diminution in the proportion of working costs to receipts, but it is quite possible that the variety here given would mean a complete scrapping of thousands of sub-offices, and their organization upon a more elaborate plan, with a more expensive management altogether—a new minimum organization which would then be too lightly loaded in many places. For railway nationalization the case is very complete and well put, but here as elsewhere there is what one may hope is a justifiable faith in the vigour and incentive of civil service control, and one wonders whether the present immense disparity in remuneration for administration would have no significance whatever in difference of economic product. Would the present directors be available at the standard salaries of civil service posts? Or would the inclusion of railway management within the ambit of the Civil Service Commissioners throw the whole of the scales of remuneration into a new and higher class? Similar problems arise in the nationalization of the coal supply, but as we are on the eve of a real experiment in this direction it may be possible to bring the main features of these proposals to a real test which it is to be hoped will not be prejudiced by the stress and wear of hurried management in war time. It seems that on the financial side, the prospects of the National budget from these two ventures are well founded, but one must speak with less certainty upon the experiment of State Insurance, the case for which is not made with the same clearness and conviction, although it is plausible enough. The final chapter—"a revolution in the Income "Tax"—is well written, practical and accurate to a degree rarely found in papers upon the subject. It contains various reasonable suggestions for removing anomalies and stopping evasion, but its main feature is a plea for the "family income" as the basis of true faculty, so arranged that the separate taxation of bachelors and childless couples would be quite unnecessary because they would be automatically "hit" in the absence of the various family allowances. Finally, a special capital tax of 10 per cent. is lightly sketched out, designed to pay off 1,200 millions of debt, but as it is to be raised over ten years by 1 per cent. annually, and to have a correlated poll tax on workers, no really good and sufficient reason has been given, economic or practical, why it should be distinguished from the ordinary income tax. Taken as a whole, the work is of unusual value, and doubtless in another generation one will wonder why it was ever called "bold." But the administrative efficiency and adequacy of the new bureaucracy are taken for granted throughout, and nowhere ever doubted: it is here perhaps that the individualist will still regard himself as unshaken by Mr. Webb's mighty onslaught.

J.C.S.

5.—*The Progress of Capitalism in England.* By W. Cunningham, D.D., F.B.A. xi + 141 pp., cr. 8vo. Cambridge: University Press, 1916. Price 3*s.* net.

Dr. Cunningham seems to have been "scandalized" by the "pragmatism" of the economist who said that history should have some practical aim, and that "some moral, some guidance should "be afforded by it." The economist in question happens to be personally interested, above all other things, in the biography of milestones, which often happen to be more or less than a mile from their neighbours for reasons other than errors of measurement, and thus occasion problems which require laborious research and exercise of the acutest logical faculty for their solution. He enunciated the doctrine which scandalizes the historian in order to facilitate the postponement of this branch of study till his declining years when he is no longer fit for the promotion of more useful science. Whether the doctrine is true or not, Dr. Cunningham admits that he has on this occasion elected to follow it: the intention of the little work before us is "to illustrate the method of treating Economic History "which may best meet the requirements of those who are less "interested in the economic interpretation of political changes in "the past than in obtaining a clear insight into the conditions of the "present."

"Capital" Dr. Cunningham understands in the very convenient sense in which it is commonly used when it is not under definition by some economist, politician or socialist with some end of his own to serve—the sense of money to invest or invested: "capitalism" is "a social organization which implies throughout the possession of "capital," and it follows after "natural economy" and "organization "in cities." This makes the subject of the book and the lectures at the London School of Economics which gave rise to it very wide—"The Progress of Capitalism in England" is the progress in England of the social organization which implies throughout the possession of capital. With so wide a subject and so small a space to put it in, it is not surprising that the book should give some impression of slightness which may have been absent from the lectures given to an audience impressed by the lecturer's vigorous personality. Sometimes everyone will agree; no one is going to quarrel with "However injurious State interference may have been in the past, "by checking individual enterprise, the experience of the nineteenth "century has convinced the British public that State interference is "sometimes necessary. It is admittedly desirable in matters of "hygiene and education; and it is coming into vogue increasingly "in connection with industry, since State regulation is the most "effective means of preventing either capitalists or labourers from "pursuing their own interests to the injury of the community. "It is, however, much to be regretted that in our time the necessary "interference with the individual should appear to be haphazard "and arbitrary, instead of depending on a carefully thought out "policy as to what is good for the country as a whole, both in its "moral and material aspects." It is so easy to recommend a carefully thought out policy! The lesson of economic history here appears too indefinite to be of use. When a definite conclusion is drawn, as for instance that various parts of the British Empire, including Ireland, ought to have complete fiscal antonomy, the argument in its favour is too slight either to convince opponents or even to confirm in their opinions those who agree with Dr. Cunningham (and the present reviewer) on this point. In his dealing with agriculture, indeed, Dr. Cunningham may be justly accused of something worse than superficiality. There is no more striking parallel in economic history than the cry for a "remunerative price" in 1815 and its revival at the present time, and nothing more instructive than the failure of the attempts of the legislature of the earlier time to give such a price. But Dr. Cunningham adopts the doctrine of remunerative price wholeheartedly, and apparently chiefly in order that the farmer may "do his land justice." What is justice to land? Getting more out of it than is justified by the price at which its products can be obtained from other land. Somebody will have to pay for that, and justice to land seems to mean injustice to men. Then where are the historical facts from which Dr. Cunningham deduces the doctrine that "conscious co-operation" between the governments of different countries "will be more stable "and lasting than the haphazard intercourse, with its incidents of "glutted markets and occasional interruptions, which arise when "international commerce is left entirely to be conducted by private "capitalists"? In these days we sigh for the glutted markets of the past as the Israelites did for the fleshpots of Egypt. We would gladly forgive the private capitalists if they brought them back, and the "occasional interruptions" of ordinary commerce seem not very alarming beside those which have been produced by the efforts of Germany, who "is not perhaps to be blamed if she has pursued "German interests and consciously exploited other countries for "her own advantage" (p. 130). Was there ever wilder "pure "theory" more contrary to all experience than this doctrine that conscious co-operation between states will be steadier than individual commerce?

In the final paragraph of the book the Archdeacon of Ely says it is only in religion that we find the condition which is most favourable to the creation of a federation of the world. We may hope, however, that the rising generation of economic historians, freed from the obsessions derived from successful Germany in the post-1870 period, may be able to assist by the adoption of less particularist views than those which have characterized their predecessors.

E.C.

6.—*The Homeworker and Her Outlook: A Descriptive Study of Tailoresses and Boxmakers.* By V. de Vesselitsky. With an Introduction by R. H. Tawney. viii + 118 pp., 8vo. London: G. Bell and Sons, Ltd., 1916. Price 2s. net.

The inquiry on which this report is based began in May, 1913, and lasted until the autumn of 1914. During this time 877 tailoresses and 330 boxmakers were visited, many of them more than once. The tailoresses were living principally in the borough of Stepney, the boxmakers in Bethnal Green, Hackney and parts of the adjoining districts. A "credible guess" estimates the number of home workers in the tailoring industry as between 15,000 and 22,000, while in the boxmaking industry "they number approximately "2,000, that is roughly in the one case 11 to 16 per cent.; in the "other 7 per cent. of the total number of women workers in the two "trades." It should be added that the output per head of these home workers is considerably smaller than the output per head in the factory and workshops.

In the tailoring trade the home workers are to be found mainly in the south, south-east and south-west of England, while the boxmaker is rarely to be found working at home except in London and Birmingham. "Home work tends to spring up in those districts "where the bad conditions of male labour make it almost indis-

"pensable for the wife to supplement the husband's earnings." Out of a group of 330 boxmakers, 258 were married and 53 were widows, while out of 877 tailoresses, 610 were married and 171 widows. Out of 353 married tailoresses who were visited 150 were "pocket-money" earners, 121 had to supplement the husband's and children's earnings, 82 were the chief breadwinners for their households. Of the first named, 76, or 50 per cent., managed to secure well-paid work and another 30 per cent. obtained fairly good prices; but of those who had to support their families by their earnings only a fourth obtained good pay, while no less than one-half had to accept the least remunerative work.

Miss de Vesselitsky describes the different classes of work, and then examines her evidence to discover the effect of the Trade Board regulations on rates of payment. Out of 554 tailoresses 134 had had their piece rates raised, 414 reported no change, and 6 reported a lowering of piece rates. "About a quarter of our "tailoresses and considerably more than half of our boxmakers "have had their piece rates raised in consequence of the Trade "Boards Act."

A different question is whether even with higher piece rates the home workers are able to earn the minimum rate fixed for the "ordinary" worker. A table is given on p. 44 distinguishing between home workers under and over 45 years of age, the able bodied and the delicate or infirm, and the trained and untrained. "It "will be seen that 54·4 per cent. of the tailoresses and 42 per cent "of the boxmakers are unable to earn the minimum rate fixed by "their respective Trade Boards." Miss de Vesselitsky emphasizes the fact that of the able-bodied and trained workers under 45, "who must presumably be held to be at least equal to 'ordinary' "workers 25 out of 121 in the case of the tailoresses and 43 out of "151 in the case of the boxmakers are not earning the minimum." But it is a defect in an otherwise excellent study that no account is taken of the extent to which work is hindered by the attention required by young children.

"While workers have, of course, been busy travelling from one "employer to another, and employers in their attempt to get rid "of the slowest workers have been busy in exchanging their "employees, we nevertheless found very little—if any—permanent "loss of employment. The most careful inquiry was not able to "reveal more than 10 tailoresses (out of about 600) whose cessation "of work could be ascribed with certainty to the Trade Boards "Act" (p. 55).

"On the whole, homes in which women work compare rather "favourably with those in which they remain inactive, and naturally "are a great improvement upon those which the mothers are forced "to desert for the advantages of the factory. . . . The fact "that home work deprives the children of too much of their mother's "care is hardly an argument for depriving them of it altogether" (p. 63).

One chapter is devoted to the home worker's point of view on "this 'ere menial wage," and the rest of the book to the consideration of difficulties of administration and suggestions for its improvement and for the amendment of the Trade Boards Act.

Finally "both boxmakers and tailoresses were agreed that a "sincere desire to benefit the condition of home workers, and to "free them from the incessant fear in which they live would find "expression in an attempt to regularize the employment of men "whose uncertain earnings are at the root both of their necessity to "work, and of the low rates of payment obtained for that work" (p. 111). C.E.C.

7.—*The Empire and the Future.* A series of Imperial Studies delivered in the University of London, King's College. 110 pp. 1916.

The Problem of the Commonwealth. By L. Curtis. 248 pp. 1916.

World Commerce in its Relation to the British Empire. By Norman R. Byers. 104 pp. 1916.

The first of the essays in the volume entitled *The Empire and the Future* is a short one by Professor Sadler on "The Universities and "the War," and its most striking portion is a plea for freedom in thought and teaching. It is followed by "The Empire and Demo-"cracy," by Sir Charles Lucas, consisting largely of a discussion of the applicability of the dictum of Thucydides : I have remarked again and again that a democracy cannot manage an Empire. Sir Charles Lucas first considers the British Empire and points out its political diversity, the form of government varying with the varying conditions of the colonies and the dependencies, and sees practical wisdom in the lack of a uniform system. He then considers modern democracy, "as represented by the rise of the Labour Party," and obviously fears that if and when the "workers" gain power they will fail to manage the Empire because of a want of mutual trust, discipline, and political vision. Much the same problem is dealt with by Mr. A. L. Smith in his essay on "People and the Duties of "Empire," but the people are seen with greater sympathy, and although the dangers of democracy are noted, yet corresponding advantages and opportunities are pointed out ; moreover, the future political education of the workers and their leaders is taken into account and proposals are made for an interchange of working class students between the Home Country and the Dominions, so that this essay ends on a note of hope and good courage. Dr. H. A. L. Fisher writes on "Imperial Administration," discussing the Civil Services of the Dominions and particularly of India ; in regard to this latter there is a very enlightened and enlightening study resulting from Dr. Fisher's investigations in connection with the Royal Commission whose report has just been published. Mr. P. H. Kerr, the editor of *The Round Table*, writes on "Commonwealth "and Empire" in an essay which deserves very wide circulation, for it puts a sane Imperialism before the reader in a way which should command the respect of all, even those opposed extremists, the so-called "Little Englanders" and "Jingo-Imperialists," whose doctrines are criticized. The Empire is conceived as a "common-"wealth" of Dominions which have already reached political maturity and self-government, and dependencies whose political advance must be the care of the home government. "The Duty of "the Empire to the World," by Dr. Parkyn, is in spirit like the preceding essay, and appropriately closes a small volume which can be unhesitatingly recommended.

The Problem of the Commonwealth had its origin in the "Round "Table Groups" which have been formed in each of the self-governing Dominions and in the British Isles to study the problems of the Empire, or the Commonwealth as they prefer to say. To facilitate an interchange of views memoranda were drawn up by the groups on the question: How can a British citizen in the Dominions acquire the same control of foreign policy as one domiciled in the British Isles? These memoranda are the basis of the report drawn up by Mr. Curtis which forms the book in question, while a more exhaustive study is being published under the title *The Commonwealth of Nations.* The present volume shows how self-government was obtained in the Colonies, how they control their internal affairs, how they had begun (before the war) to contribute to the cost of Imperial defence by the provision of naval power, and how in the Imperial Conferences they had consulted with the British Government to co-ordinate certain of their arrangements. It shows as clearly how the Dominions have stopped short of complete self-government; they have had control neither of foreign affairs, that is, the matters which may determine political life or death, nor of peace and war; the government of the British Isles might and did involve them in war without their advice or consent. The complete impotence of the Dominions in these fundamental matters is also shown to be resented in the Dominions and it is concluded that the present condition of affairs cannot be maintained: either the Colonies must secede or they must be admitted to an equitable share of complete power.

Mr. Curtis then considers, very carefully and thoroughly, what this change would necessitate and he concludes that there must be Dominion Parliaments (including one for the British Isles) to manage the internal affairs of each part of the Empire, and also an Imperial Parliament to deal with foreign affairs, defence, and the provision of the funds necessary for these purposes. This Imperial Parliament would be elected from, and responsible to, all the Dominions, and it would control the Imperial Cabinet entrusted with executive powers, which would be distinct from the British Cabinet responsible to the British Parliament and people.

The whole matter is clearly set out and acutely argued, and the book ends with a plea for an Imperial Convention to undertake the drafting of an Imperial Constitution. If on every point the author does not carry conviction, he has certainly done a great service both in showing the need for reform in Imperial matters, and also in presenting a scheme which on the whole commends itself to the present reviewer more than any other hitherto published.

World Commerce in its Relation to the British Empire is written by Mr. Byers with equal earnestness, but lacking the wideness of view and the careful thought and accurate expression of Mr. Curtis' work. Mr. Byers sees as an ideal the economic self-sufficiency, if not the economic isolation, of the Empire, and views it from the standpoint of the British manufacturer seeking a market. The limitation of his view is revealed when after stating that "Mr. "Hughes, the Australian Premier, was the moving spirit in bringing "about an agreement with our Allies for the purpose of protecting "ourselves from trade invasion by the Central Powers after the "war," he adds: "We are left wondering how much farther any "Imperial Federation, or paper constitution, formed upon the most "democratic lines, could have gone." There is much exhortation to various classes of people, but the chief definite proposal (to which the publishers draw special attention) is in regard to the excess profits tax; it is that half of this tax should be returned in the form of bonds which should be non-interest-bearing for five or seven years after the war. Mr. Byers thinks that these bonds would form security for credits from joint-stock banks, and that these would enable manufacturers to expand their trade after the war, make their markets secure, and so remove from the minds of the workpeople that fear of unemployment which is the cause of labour troubles. The logic is not apparent, nor does a re-reading of the relevant parts of the book convince the reviewer of the accuracy of the diagnosis or the efficiency of the remedies for our economic ills. J.F.U.

8.—*The Belief in God and Immortality: a Psychological, Anthropological and Statistical Study.* By James H. Leuba. 340 pp., 8vo. Boston: Sherman, French and Co., 1916. Price 2 dollars.

The first half of this book is for theologians and philosophers, but the second half is a "statistical study" that may quite possibly take a real place in the history of the development of statistical method. The author claims to have avoided the "usual fatal "defects of statistical researches" in the field of beliefs, and he hopes that his research will be found worthy of attention by those interested in the possibilities of the statistical method. His claim is that he has established statistics valid for whole homogeneous *groups* of people, and also that similar statistics obtained at different times would provide a measure of "some of the changes that take place "in the moral life of a given population." There is no doubt that as an example of what can be attempted by the *questionnaire*, well guarded from its primitive defects, and used with proper regard to scientific principles of sampling, the inquiry is notable, and opens an inviting outlook for the possibilities of statistical methods. Percentages of students, historians, biologists, philosophers and sociologists (as separate groups) who believe (1) in God, and (2) in personal immortality, are obtained. But statistical interest is quickened when Professor Leuba divides his groups into "lesser" and "greater" men, and claims to establish a "correlation between "eminence and disbelief of momentous significance." Without an actual quantitative expression of varying degrees of eminence, it is not, of course, possible to work out a correlation coefficient, so that it can only be said that in each group the more eminent persons seem to comprise a larger percentage of "disbelievers." But it is when inferences begin to be made from these statistical results that perils, greater than usual, attend the inquirer. Professor Leuba's own persuasion is such that irrefutable conclusions leap to his mind. But why should this "correlation" establish anything at all as to the reality, or credibility, or worth, of the ideas of God and immortality? One has only to postulate that individual time for thought or inquiry is limited, that belief and eminence vary directly as the amount of time or thought given to consideration, to get just such statistics as these, showing "eminence" incompatible with "belief." Even so might one find negative correlations between eminence in science and love of music—but the place of music in life would still be sure and secure. Darwin was not the only one who dominated one ability by atrophy of some worthy sensitivenesses; and religion, if not theology, is still claiming to be the science of a spiritual eye. J.C.S.

9.—*The Administration of Industrial Enterprises, with Special Reference to Factory Practice.* By Edward D. Jones, Ph.D., Professor of Commerce and Industry in the University of Michigan, vii + 442 pp. Longmans, Green and Co., 1916. Price 7*s.* 6*d.* net.

Dr. Jones describes the object of his book as being "to present "what may be called first-class practice in the administration of "industrial enterprises. The manufacturing industry is the one "which has been held in mind chiefly. The major topics, in the "order of their presentation, are, first, the problem of equipment; "second, the formation of an administrative organization; third, "the adjustment of the relations of labour and capital; and, fourth, "the process of mercantile distribution." How far the business man can use books of this kind is a matter of some doubt, and in this respect the different sections of the book are of different value. The chapters dealing with the choice of the location of a new business, the structure of the factory, the nature of its equipment, and the character of the power used are necessarily of a very general description, and, so to speak, deal more with a factory in the abstract than serve as a guide to the construction and equipment of any particular building. This, of course, could not be avoided, and the main utility of this part of the book is to show to the business man what experience shows that they often forget, namely, that a new factory cannot be dumped down anywhere, anyhow, and make profit automatically.

Coming to the human side of business life the value of this volume mounts considerably. It is inspired by that new spirit of the scientific study of efficiency which is changing many sections of American business, notably the engineering trade. "American "industry is now concerned with a newly announced code of rules "known as 'scientific management,' which aims to give greater "precision and efficiency to the productive processes involved in "manufacturing." This new scientific method is found to be the old processes of analysis, classification, deduction, and criticism, and its best advertised applications are in what are known as time studies and motion studies. Many people, indeed, fancy that scientific management resides in the stop-watch, and, consequently, a driving management will take over some of the results of the scientific analysis of labour methods, and use them for the extraction of greater profits and the depression of the workman. Elimination of waste, economy of effort, the appropriation of tasks to abilities—these are the principles that underlie the "new" methods. Dr. Jones very clearly points out that the factory system is now separating the administrator from the capitalist, as it has already separated capital from labour. "Property right is a slow thing to move, "hampered as it is by much definition in books of record, and "impeded by the dead weight of vested interests; but the art of "administration is a thing of active change, responding to the "forward-reaching of natural leaders in the prime of life towards "ideals." From the new administrator comes the new spirit. The new management requires an increased administrative staff with specialized functions to plan out work in advance and supervise its performance, building up their plans on analysed standards of work. They replace the old general manager and general foreman and while the workman is deprived of much of his old freedom to work well or ill he has the opportunity of rising into the class of functional foremen with prospects greater than those previously before him. The necessity for a high efficiency rate of wages is fully recognized, but the "efficiency engineers," and our author, are inclined to deal with the workman purely as an individual. That is the defect of scientific management and of the otherwise excellent wage chapters in this book. If one thing is more certain than another it is that scientific management can only be a success if it is based on the cordial consent of the trade unions; that is made abundantly clear by the disputes which arise over premium bonus systems when administered by driving managements.

Were it not that the book almost exclusively considers American conditions it would make an admirable text-book to use in the economic faculties of our Universities, and even as it is it would prove extremely useful in the hands of a teacher who would point out the differences between British and American practice. Indeed, in many ways the fact that the book deals with a novel set of conditions would make it prove stimulating to a bright student. One may express the opinion that a similar book dealing with British conditions and practice is badly wanted and that it is "up to" one of our newer Universities to produce it. H.W.M.

10.—*Other New Publications.**

British Agriculture. The Nation's Opportunity, Being the Minority Report of the Departmental Committee on the Employment of Sailors and Soldiers on the Land. By the Hon. Edward G. Strutt, Leslie Scott, M.P., and G. H. Roberts, M.P., with preface by A. D. Hall, F.R.S. xi + 168 pp., 8vo. London: John Murray, 1917. Price 3*s*. 6*d*. net.

[This report may be taken as the first considered effort to frame a programme for the reconstruction of rural life. Three conditions for the development of agriculture are described at length in this book. They are the establishment of such a level of prices as will render extensive farming possible; the improvement of the position of the labourer as regards wages, housing, and the amenities of life; and lastly, the recognition of the fact that the ownership of land carries with it a duty to the community. The book is divided into the following parts:—Part 1. The Policy of the Plough (by a Free Trader); Part 2. Settlement on the Land; Part 3. The Minority Report; Appendix. Memorandum on Reclamation, by A. D. Hall, F.R.S.; Addenda to the Minority Report.]

Cadoux (*Gaston*). The Economical Prosperity of Germany. Her "place in the Sun" and the War. 37 pp., 8vo. Paris, 1916.

[Contents:—The Pangermanic Dream; Comparative Importance of the German Race; Movements of the Population; Emigration; The Appeal to Foreigners; The German Population of the Colonial Dominions; Relation between the Number of German Workmen Employed and the Population of the Empire; Salaries and the Consumption of Articles of Food; Consumption of Raw Materials; Development of Private Wealth and of Savings; Savings; External Trade; The Merchant Navy; Financial Progress.]

Cole (*G. D. H.*). The World of Labour. A Discussion of the present and future of Trade Unionism. xxiii + 443 pp., 3rd edition. London: G. Bell and Sons, 1917. Price 3*s*.

[Contents:—Chapters: 1. Means and Ends; 2. The Labour Unrest; 3. Labour in France; 4. Comments on the French Labour Movement; 5. Labour in America; 6. Further Lessons from Abroad—The General Strike; 7. Trade Union Structure—Industrial Unionism and Amalgamation; 8. Trade Union Government—Centralisation and Local Autonomy; 9. Social Peace and Social War — Conciliation and Arbitration; 10. Labour's Red Herrings—The Function of Co-operation; 11. The Control of Industry—Syndicalism and Collectivism; 12. The Future of Trade Unionism; 13. Economics and Politics; 14. Hopes and Fears; Bibliography.]

Cunningham (*W.*). English Influence on the United States. xii + 168 pp., 8vo. Cambridge: University Press, 1916. Price 4*s*. 6*d*. net.

[This little volume is composed of addresses delivered in different American cities in 1914, and were intended to show the close connection between English and American life, notwithstanding certain divergences between the two countries which have shown themselves from the first and are still maintained. The following contents will show the scope of the book:—1. The Township: The Settlement in Britain and in America Compared; The Township in England; The Changes in New England.

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* See also "Additions to the Library," page 346, *sqq*.

Cunningham (*W.*). English Influence on the United States.—(*Contd.*)
2. Town Planning: Comparison of the Growth of English and of American Towns; Building Plots for Private Houses; The Fire of London. 3. Public Buildings: Monuments of Civic Patriotism in England; Meeting Houses: Renaissance Architecture; The Stars and Stripes. 4. The College Course: Emmanuel and Harvard; The Scottish Universities; Princeton and Edinburgh; Public Libraries. 5. Modern Social Problems: Patriarchal and Progressive Societies; The Elizabethan Realm; The Nation and its Dependencies; The Industrial Revolution and its effects in England; The Awakening of the British Conscience. 6. The Responsibilities of National Power and Influence: The Tradition of Insular Policy; The Claim to Arbitrate; The British Empire in the Twentieth Century; Imperial Co-operation; The Ties of Kinship.]

Drachmann (*Povl.*). The Industrial Development and Commercial Policies of the three Scandinavian Countries. Edited by H. Westergaard. (Carnegie Endowment for International Peace.) 124 pp., 8vo. Oxford: Oxford University Press, 1915. Price 4*s.* 6*d.*

[This book, which is issued under the auspices of the Division of Economics and History of the Carnegie Endowment for International Peace, gives a good general survey of the economic development and trade policies of Denmark, Sweden and Norway, each country being treated separately. There is, however, no general survey for the three countries as a whole, and such statistics as are given might have been, in certain cases, of more recent date.]

Figard (*Jean*). Lendemains financiers d'une guerre. Leon Say. Ministre des Finances après 1870-71. Préface de M. André Liesse. 275 pp., 8vo. Paris: Librairie Felix Alban, 1915. Price 3 francs.

[Contents:—Introduction: I. Biographie de Leon Say; II. Plan de l'ouvrage. Première Partie, Lendemains Financiers de la guerre: Chapitres 1. Leon Say et la Ville de Paris; 2. Un aperçu de l'état des Finances nationales au moment de l'armistice; 3. La libération anticipée du territoire; 4. Rapport sur le payement de l'indemnité de guerre de cinq milliards; 5. Le remboursement des avances consenties par la Banque de France à l'État pendant la guerre; 6. Conversion de l'emprunt Morgan; 7. Le compte de liquidation; 8. Principes financiers mis en œuvre pendant cette periode. Deuxième Partie, Le retour à une prospérité durable; 9. Quelques principes budgetaires; 10. La préparation du budget; 11. La discussion du budget; 12. L'impôt. Conceptions libérales et conceptions socialistes; 13. L'impôt foncier; 14. Des dégrèvements; 15. Le crédit public; 16. Limitation de la frappe des pièces de cinq francs en argent; 17. La conversion; 18. Le plan de travaux publics et la création du 3 p. 100 amortissable Conclusion: 19. La situation financière de 1871 à 1883; 20. Léon Say à l'opposition.]

Fisher (*Irving*). The need for Health Insurance. Reprinted from the *American Labour Legislation Review*, 1917. 16 pp., 8vo. New York, 1917.

[An address advocating compulsory health insurance for the United States, which would, the author contends, reduce destitution due to sickness, reduce illness itself, improve the working power of men and women, and thereby raise the wage level and diminish the causes of industrial discontent.]

Hamp (*Pierre*). La France pays ouvrier. Deuxième édition. 65 pp., 8vo. Paris: Nouvelle revue française, 1916. Price 2 frs. 50 c.

Herschel (*Sir William J.*). The Origin of Finger-Printing. 41 pp., 8vo. Oxford University Press, 1916. Price 1*s.* net.

[The object of this pamphlet is to place on record the genesis of the finger-print method of personal identification in Bengal and to examine such evidence as exists as to its earlier use in Europe, and especially in China.]

Hobson (*John A.*). The Evolution of Modern Capitalism. A Study of Machine Production. xvi + 488 pp., 8vo. New edition. London: Walter Scott Publishing Co., 1917. Price 6*s.*

[The 1906 edition of this book was reviewed at length in the *Journal* for December, 1906. In the present edition the author has added a long supplementary chapter, the first part dealing with movements of industry and commerce during the decade that preceded the war, and the latter portion with some of the new economic facts and forces revealed by the experiences of the war and their future probable results.]

Holden (*Sir Edward H.*), *Bart.* The Foreign Exchanges and British Credit in time of War. Privately printed. 49 pp., 8vo. Toronto: John Mackay and Co., 1916.

[A reprint of Sir Edward Holden's address to the shareholders of the London City and Midland Bank, in 1916; primarily for circulation among the leading publicists of Canada, giving as it does a clear exposition of the working of the foreign exchanges during war, and comparing the financial conditions of Germany and Great Britain.]

Hovre (*Fr. De*), Th.D. German and English Education. A Comparative Study. 108 pp., 8vo. London: Constable and Co., Ltd., 1917. Price 2*s.* 6*d.* net.

Johnston (*Joseph*). Food Production in France in time of War. Supplementary Report to the Trustees of the Albert Kahn Travelling Fellowship. 32 pp., 8vo. Dublin: Maunsel and Co., Ltd., 1916. Price 6*d.*

[This pamphlet describes briefly the administrative work undertaken in France to secure the continued production of food rendered difficult by the shortage of labour due to the men having to join the army. Details are also given of the work of women on the land, and the employment of prisoners of war. The author also discusses the agricultural aspect of the national endeavour in this country, which does not compare very favourably with that of France.]

Kemmerer (*Edwin W.*). Modern Currency Reforms. A History and Discussion of Recent Currency Reforms in India, Porto Rico, Philippine Islands, Straits Settlements and Mexico. xxi + 564 pp., 8vo. New York: Macmillan and Co., 1916. Price $2 40 cents.

[A close study of recent currency reforms in the five countries mentioned above. The author has been collecting the material for this book for thirteen years, during nearly three of which he was engaged, on behalf of the American Government, in investigating monetary problems in some of the countries whose currency reforms are here described. In each of the five countries the problems of currency reform were found to be different, though offering certain similarities, and as each country has been dealt with separately in an essay complete in itself, a certain amount of repetition has been unavoidable. The book deals with Currency Reform in India, Porto Rico, the Philippines, the Straits Settlements and Mexico, setting forth the methods followed and the results attained in each case. There are useful Appendices, both statistical and bibliographical, relating to each of the five countries discussed.]

Lachapelle (*Georges*). Nos Finances pendant la Guerre. 306 pp., 8vo. Paris: Librairie Armand Colin, 1915. Price 3 fr. 50 c.

[Contents:—Avant Propos: Première Partie; Avant la Guerre. Chapitre 1. Le Budget; 2. L'accroissement des charges publiques; 3. Le déficit; 4. Les expédients. Seconde Partie; Pendant la Guerre: 5. La déclaration de guerre; 6. La Bourse de Paris; 7. Les sociétés de crédit; 8. La Banque de France; 9. La gestion des finances publiques pendant la guerre; 10. Le budget de la Défense nationale.]

Lawson (*W. R.*). British War Finance: 1914–15. 367 pp., 8vo. London: Constable and Co., Ltd., 1915. Price 6*s.* net.

[Contents:—Part 1. An Averted Panic: Chapters 1. A World Wide Deadlock; 2. The Foreign Exchanges Blocked; 3. The Bill Market Paralysed; 4. The Stock Exchanges Closed; 5. A Colossal Amount of Negotiable Securities at Stake. Part 2. Relief Measures: 6. The Saviours of the Situation; 7. The Moratoria; 8. Lombard Street Relieved; 9. The Stock Exchange Loans; 10. The Foreign Financial Invasion Checked. Part 3. "Emergency Government": 11. Its Flood of Emergency Regulations; 12. Enemy Trading; 13. Our German Exploiters; 14. Public Contracts; 15. State Trading Ventures. Part 4. The Treasury Regime: 16. The Treasury and the Banks; 17. The Treasury and the Stock Exchange; 18. The Treasury and the Traders; 19. Its American Exchange Perplexities; 20. War Bills for Thousands of Millions Sterling; 21. Our Intricate and Perplexing Taxes; 22. The Doom of the One-Man Budget; 23. The London, Paris and Petrograd Partnership; 24. The Perils of a Patched-up Peace. Index.]

Leeson (*Cecil*). The Child and the War. 69 pp., 8vo. London: P. S. King and Son, Ltd., 1917. Price 1*s.* net.

[The author, who is the secretary of the Howard Association, deals with the grave increase in juvenile crime since the war, and especially in juvenile thieving, and its spread over the whole country. He considers that much of it is preventable, and that it is possible so to restore and reorganize the services of childhood as to considerably reduce the evil.]

Macdonald (*George*). The Evolution of Coinage. viii + 148 pp., 8vo. Cambridge: University Press, 1916. Price 1*s.* 3*d.*

[This little book belongs to the series of *Cambridge Manuals*, and aims at dealing with only one aspect of a large subject. It is divided into the following chapters:—Chapters 1. Introductory; 2. Coinage and the State; 3. The Material of Coinage; 4. Form, and Methods of Production; 5. Types; 6. Legends; 7. Dates and Marks of Value; Key to the Plates; Select Bibliography; Index.]

Moulton (*Harold G.*). Principles of Money and Banking. A series of Selected Materials, with Explanatory Introductions. xl + 502 pp., 8vo. Chicago: University of Chicago Press, 1916. Price 12*s.* 6*d.*

[This volume of readings includes a discussion of the various monetary controversies, and deals with the subject of money in connection with the evolution of economic society. On the banking side, in addition to the usual treatment of commercial banks, including the operation of the new Federal Reserve system, the book makes a careful analysis of the principles of agricultural credit, and of savings and investment institutions. It ends with a discussion of the problem of financial concentration and control, popularly called the "money trust." The explanatory introductions to the various chapters give continuity to the wide variety of materials, tables, charts, arguments, opinions, &c., and in this way the virtues of a text and a collateral book of readings are combined in one volume.]

Mukerjee (*Radhakamal*), M.A. The Foundations of Indian Economics, with an Introduction by Professor Patrick Geddes. xxvi + 515 pp., 8vo. London: Longmans, Green and Co., 1916. Price 9*s.* net.

[The author has attempted in this book to describe the main features of Indian industrial life, and to formulate a programme of Indian economic expansion. In it are examined the socio-economic data derived from institutions like caste and the joint family, as well as the economico-religious ideas and institutions, and the peculiarities and special features of Indian consumption, which are still living forces in Indian economic life. An inductive study is made of the principal cottage and village industries, which are still holding their own with a remarkable vitality, and exhibit in their nature a striking though not perfect adaptation to their environment, and are ultimately sustained by the moral ideas and ideals it involves. The machinery of exchange and distribution which this Indian industrial system has evolved are also studied, and also the characteristic methods of trade, transport and credit, which are adapted to and subserve the productive organization. Finally, the author has tried to indicate in a general way the lines of Indian economic advance, showing the scope of factory, workshop, and cottage industry in the industrial progress of the future. The book is illustrated and fully indexed.]

O'Hara (*Frank*). Introduction to Economics. 259 pp., 8vo. New York: Macmillan and Co., 1916. Price 4*s.* 6*d.* net.

[A manual of the elementary principles of economics for the general reader and for the student. It attempts to lay the foundations for economic reasoning rather than say the final word on the great present-day questions of economic policy.]

Phillips (*Chester Arthur*). Readings in Money and Banking. Selected and adapted. 845 pp., 8vo. New York: Macmillan and Co., 1916. Price $2 10 cents.

[This volume consists of selections from different writers on money and banking, and is intended primarily for class-room use in connection with one of the introductory manuals dealing with these subjects. It covers a wide field, and, in consequence, some of the subjects receive but brief notice, but the book is of value nevertheless from the very extent of the information given.]

Phipson (*Cecil Balfour*). The True Cause of the Commercial Difficulties of Great Britain. Edited by Mark B. F. Major and Edward W. Edsall. 153 pp., 8vo. London: Allen and Unwin, 1917. 2*s.* 6*d.* net.

[It is claimed that this work discloses an unconsidered (but surprisingly obvious) factor in the fiscal controversy, showing that since the internationalization of gold the principles of Free Trade have ceased to operate, and that for their restoration Great Britain must regain the use of a purely national money standard, such as she used prior to 1874, when her commercial prosperity was phenomenal. The required change having almost been effected by the development of the cheque system, the Government have only to complete it by demonetizing gold and issuing the Treasury notes as sole legal tender.]

Richmond (*Kenneth*). The Permanent Values in Education, with an Introduction by A. Clutton-Brock. xxiii + 136 pp., 8vo. London: Constable and Co., Ltd., 1917. Price 2*s.* 6*d.* net.

[These studies originally appeared in "The Times" Educational Supplement and deal more particularly with the historical side of education.]

Rothband (*Henry L.*). Employment for Disabled Sailors and Soldiers. A Scheme for a National Roll of Employers. (Privately printed.) 72 pp., 8vo. Manchester, 1917.

[This pamphlet is in three parts. The first summarizes the argument for a Royal and National Roll of Employers, which has been put forward by Mr. Rothband of Manchester. The second part narrates the history of that scheme from its first inception to the present. The third part contains a number of documents that bear on the scheme and further illustrate its history.]

Ryan (*John A.*), D.D. Distributive Justice. The right and wrong of our present distribution of wealth. xviii + 442 pp., 8vo. New York: Macmillan and Co., 1916. Price 6*s.* 6*d.* net.

[The author, who is an Associate Professor of Political Science at the Catholic University of America, Washington, discusses systematically and comprehensively the justice of the processes by which the product of industry is distributed. Inasmuch as the product is actually apportioned among land-owners, capitalists, business men and labourers, the moral aspects of the distribution are studied with reference to these four classes. While their rights and obligations form the main subject of the work, there are also proposed reforms that would, the author claims, remove the principal defects of the present system and bring about a larger measure of justice.]

Turnor (*Christopher*). The Land and the Empire. 144 pp., 8vo. London: John Murray, 1917. Price 3*s.* 6*d.* net.

[The lectures of which this book is composed were delivered as part of the Imperial Studies Series inaugurated by Lord Milner, and they are published to emphasize the need for a new outlook on both the rural and urban sides. As regards the agricultural side, the author emphasizes the necessity for a greater organization and encouragement of the agricultural industry. On the urban side, the people must realize that the country should never again be so dependent upon sea-borne food as has been the case during the past fifty years. Security of supply rather than a cheap supply at all hazards should be the motto in future. The workers also should have a new outlook as regards the economics of industry, and realize that their improvement lies in unrestricted individual output.]

Webner (*Frank E.*). Factory Accounting. xii + 345 pp., 8vo. Chicago: La Salle Extension University, 1917. Price $2 75 cents.

[Owing to the rapid industrial evolution in recent years, factory accounting has assumed great importance, and the author's endeavour has been to supply a book which will be of value to accountants, manufacturers, and students generally.]

Wergeland (*Agnes Mathilde*). History of the Working Classes in France. A review of Levasseur's Histoire des Classes ouvrières et de l'Industrie en France avant 1789. vi + 136 pp., 8vo. Chicago and London: Cambridge University Press, 1916, Price 4*s.* 6*d.* net in United Kingdom.

[This review, which appeared in the American *Journal of Political Economy*, is rather in the nature of a running commentary on M. Levasseur's book, for which, it is stated in the Preface, the author showed much appreciation. It throws emphasis on the chief features of the book, and it is hoped will raise the student's desire for a closer acquaintance with the original.]

Williams (*J. Fischer*). Proportional Representation and British Politics. 99 pp., 8vo. London: John Murray, 1914. Price 1*s.* net.

[Contents:—Introduction; The Present Representative System; The Proportional System: Some Applications of Proportional Representation (The Federal Solution, Second Chambers, Municipalities); Objections; The Movement Outside the United Kingdom; Appendix (The Proportional Representation Bill) and Index.]

Italy. Circolo Giuridico di Napoli. La Legislazione di Guerra. Conferenze tenute nell anno 1915-16 dai Soci Augusto Graziani, Domenico Schiappoli, Enrico Presutti, Roberto de Ruggiero, Angelo Mariotti, Federico Celentano. 278 pp., 8vo. Napoli, 1916.

[These conferences, six in number, deal with economic and financial questions raised by the war, more especially in regard to Italy. The cost of the war and its relation to national and international law are also considered.]

Russia. Russian Union of Zemstvos. A brief report of the Union's activities during the War, with an Introductory Note by Prince G. E. Lvov. January, 1916. 39 pp., 8vo. London: P. S. King and Son, 1917. Price 1*s.* net.

[The word "Zemstvo" is generally understood in England as Rural County Council. Thus the Russian Union of Zemstvos means the Russian Union of Rural County Councils. . . . This description of the Russian Union of Zemstvos, or, as it might be called, a union of the self-governing and public-spirited bodies, aims at explaining its broad activities as an institution. It may help towards an understanding of the work of the Union in its varied important spheres.]

Sweden. Skogsarbetarnas Levnads- och Arbetsforhallanden i Varmland, Dakarna och Norrland. 244 + 399 pp., 8vo. Stockholm: Isaac Marcus, 1916.

[A report on the social conditions and wages and hours of labour of lumbermen and others employed in the woods and forests in certain regions of Sweden.]

Sweden. Arbetstidens längd vid frisersalonger och badinrättningar i Sverige. 130 pp., 8vo. Stockholm: P. A. Norstedt and Söner, 1916.

[An inquiry into the conditions as regards the hours of labour and the extent of Sunday labour among employees in hairdressing and bathing establishments in Sweden.]

CURRENT NOTES.

The returns of our foreign trade continue to show values of imports exceeding those of any corresponding period. The summary given below, covering the twelve months ended February, records increases in each of the great classes of imports and exports, though re-exports of food and of raw materials of industry show some reduction in value as compared with the like period a year earlier. The continued rise in the level of prices must not be ignored in endeavouring to measure the changes in the volume of trade by means of the aggregate figures representing its value, but the increase of over 28 per cent. in the value of exports of United Kingdom produce cannot be wholly attributed to price changes. The excess in value of imports over total exports shows a slight decrease—from 355,464,000*l.* to 353,081,000*l.*; but there is no published information as to the value of imports on Government account not included in the monthly returns. The subjoined table shows the principal figures:—

	Twelve months ending February, 1917.	Twelve months ending February, 1916.	Increase (+) or Decrease (−).
Imports, value c.i.f.—	£'000.	£'000.	£'000.
I. Food, drink and tobacco	425,522,	384,821,	+ 40,701,
II. Raw materials and articles mainly unmanufactured	353,635,	287,978,	+ 65,657,
III. Articles wholly or mainly manufactured	185,783,	185,699,	+ 84,
IV. Miscellaneous and unclassified (including parcel post)	3,414,	3,221,	+ 193,
Total merchandise	968,354,	861,719,	+ 106,635,
Exports of produce and manufactures of the United Kingdom, value f.o.b.—			
I. Food, drink and tobacco	28,578,	25,680,	+ 2,898,
II. Raw materials and articles mainly unmanufactured	65,662,	54,856,	+ 10,806,
III. Articles wholly or mainly manufactured	404,162,	306,735,	+ 97,427,
IV. Miscellaneous and unclassified (including parcel post)	19,200,	16,267,	+ 2,933,

	Twelve months ending February, 1917.	Twelve months ending February, 1916.	Increase (+) or Decrease (−)
Exports of foreign and colonial merchandise, value f.o.b.—	£'000.	£'000.	£'000.
I. Food, drink and tobacco	20,102,	21,865,	− 1,763,
II. Raw materials and articles mainly unmanufactured	49,831,	58,286,	− 8,455,
III. Articles wholly or mainly manufactured............................	27,627,	22,510,	+ 5,117,
IV. Miscellaneous and unclassified	111,	56,	+ 55,
Total British, foreign and colonial	615,273,	506,255,	+ 109,018,

Nearly all the principal industries, especially those connected with war requirements, have continued to be fully employed during the first three months of the present year. Owing to further enlistments, the shortage of men has increased and much overtime has been worked. The percentages of workpeople unemployed, as shown by the Trade Union returns, by the returns for "insured trades" under the National Insurance Act of 1911, and by the series of statistics recently instituted in the *Board of Trade Labour Gazette* relating to workpeople insured under the National Insurance (Part II) (Munition Workers) Act, 1916, respectively, have been as follows :—

At the end of	Percentage of unemployed.		
	Trade Unions.	Insured Trades (National Insurance Act, 1911).	Workpeople insured under the National Insurance (Part II) (Munition Workers) Act, 1916.
January ...	0·3	0·64	0·61
February ...	0·3	0·62	0·74
March	0·3	0·58	0·81

The employers' returns for the textile trades showed 5·3 per cent. fewer workpeople employed in the week ended March 24, 1917, than in the corresponding week of 1916, while there was a rise of 7·2 per cent. in the wages paid. In all the trades covered by the returns there was a fall of 6·5 per cent. in the numbers employed and a rise of 6·0 per cent. in the wages paid.

In Germany, the Trade Union returns showed 1·6 per cent. unemployed at the end of February, 1917, as compared with 1·7 per cent. at the end of November, 1916, and January, 1917, and

1·6 per cent. in December, 1916. At the end of February, 1916, the percentage was 2·8. In the textile trades, the percentage, which was 12·1 in February, 1916, and 13·7 in November, 1916, fell to 11·8 in December, 1916, and 10·0 in January, 1917, and was 10·2 at the end of February, 1917.

The increase in retail food prices in the United Kingdom continued in December, 1916, and during the first three months of the present year. The percentage increase over July, 1914, prices, at the beginning of each month, as shown by the Board of Trade index numbers published in the *Labour Gazette*, was as follows :—

1916,	December	84
1917,	January	87
	February	89
	March	92
	April	94

The average rate of increase during these four months, though less than in the year 1916 as a whole, is appreciably greater than was recorded in the corresponding months of either 1915–16 or 1914–15. The articles mainly responsible for the increase since December 1 are cheese, meat, margarine, bacon, and bread. The price of eggs has fallen (from seasonal causes), and potatoes, after a sharp rise during the autumn and winter, showed a decrease in February owing to the action of the Food Controller in fixing a maximum price.

The principal increases in price since the beginning of the war are in sugar (172 per cent.), the cheaper cuts of meat (108 to 157 per cent.), fish (132 per cent.), cheese (117 per cent.), potatoes (117 per cent.), flour (100 per cent.) and bread (93 per cent.). The articles showing least increase are margarine (49 per cent.), milk (60 per cent.), and tea (63 per cent.).

The figures given above apply only to food, and as is pointed out in the *Labour Gazette* no allowance is made, in arriving at the general percentage increases given, for the considerable economies that might be effected by changes in dietary, *e.g.*, by substituting margarine for butter, omitting eggs and reducing the consumption of sugar. If rent, clothing, fuel and light, &c., be included it is estimated that the average increase in the cost of living of a working-class family from July, 1914, to the end of March, 1917, taking the same quantities and descriptions of the various items at each date and eliminating advances arising from increased taxation, is over 65 per cent.

The latest official figures available in this country as to the retail prices of food in Germany are those published in the *Labour*

Gazette for January, 1917. These figures, which are based on official data in the *Statistische Korrespondenz,* relating to the prices of 17 articles of food in Berlin in November, 1916, show a rise of 0·7 per cent. as compared with the previous month, and of 110·5 per cent. as compared with July, 1914. Of the 17 articles on which the figures are based, 13 showed no change in price between October and November. The price of pork increased by 9·6 per cent. and that of wheaten flour by 7·7 per cent., while the prices of rye flour and beef fell by 10 per cent. and 4·2 per cent. respectively. For Vienna, a table given in the April issue of the *Labour Gazette,* based on the official journal *Warenpreisberichte,* shows a rise of 1·7 per cent. in January, 1917, as compared with December, 1916, and of 171·7 per cent. compared with July, 1914. Owing to the fact that the index numbers for Germany and Austria-Hungary are based largely on officially fixed maximum prices, the statistics of retail prices for those countries afford no guide to the state of supplies and are not comparable with figures based on prices in a free market. In the case of Berlin, the value of the particulars given for November is further impaired by the omission of haricot beans and split peas from the list of items included in the statistics, price quotations for these two articles, which had previously been included, being no longer available.

The movement of wholesale prices since December, 1916, as shown by the *Statist* and *Economist* index-numbers, has been as follows :—

Month.	*Statist* index-number.	*Economist* index-number.
July, 1914	82·4	116·6
December, 1916 ...	154·3	223·0
January, 1917 ...	159·3	225·1
February, 1917 ...	164·0	230·5
March, 1917 ...	168·4	240·9

The *Statist* index-number rose by 9 per cent., and the *Economist* number by 8 per cent., during the three months. Each of the several groups of commodities contributed towards the rise, but those chiefly affected in the *Statist's* groups were textiles and foods, the index-number for textiles rising from 150·4 to 174·8 or by 16 per cent., and that for food from 155·0 to 169·7 or by 9½ per cent. Timber and oilseeds also rose considerably in price. At the end of March, both the *Statist* and the *Economist* index-numbers were at more than twice the height of July, 1914.

The *Gazette* average price of British wheat, which rose from 49*s.* 3*d.* in July, 1916, to 73*s.* 4*d.* in December, 1916, has continued to rise, having been 75*s.* 9*d.* in January, 1917, 76*s.* 2*d.* in February, and 79*s.* 2*d.* in March.

One of the many difficulties met with in the classification of deaths by cause is the loose or indefinite method of statement sometimes employed in certification. An attempt is made to overcome this difficulty in compiling the official mortality statistics both of this country and of the United States by inquiries addressed to the medical practitioners (or coroners) concerned, indicating the nature of the further information desired for purposes of classification, but naturally the inquiries issued form only a fraction of those which might be desirable if the labour of issuing them and the patience of the hard-worked men to whom they are addressed had not to be taken into consideration. The inquiries in this country, apart from those issued by certain medical officers of health, have amounted to only 1–2 per cent. of the certificates received, but a recent article contributed to the American Statistical Association by Messrs. Dublin and Kopf of the Metropolitan Life Insurance Company, New York, records the results of a series of inquiries amounting to 8·5 per cent. of the certificates received, all those received by the company being queried, apparently, where there was any reason for doing so. The results upon classification of the further information which was obtained in about three-quarters of the cases queried are tabulated on a more elaborate scale than the corresponding table in the Annual Reports of the Registrar-General. One table shows the effect of the additional information obtained upon some 45 headings of the International List of Causes of Death. Deaths attributed to cerebrospinal fever were increased from 138 to 536, or by no less than 288 per cent., the next greatest increases being those recorded for syphilis, 78 per cent., and for gonococcus infection, 130 per cent. Alcoholism increased by 21 per cent. A second table records the ill-defined terms originally used with the classification after inquiry in the case of each. It is interesting to note that of the 1,754 cases where supplemental information was obtainable with regard to certifications of "pneumonia," one-third proved to have been regarded as lobar and one-third as broncho pneumonia, 228 of the remainder being due to influenza. Rather more than half the changes from meningitis were to cerebrospinal fever or tuberculous meningitis, while an appreciable proportion were transferred to pneumonia or to diarrhœa. A third table shows for each cause of death title receiving additions the added cases classified by the terms under which they were originally certified. This table shows that the additions to syphilis were mainly from general paralysis of the insane and locomotor ataxy. In view of the present belief as to the origin of these diseases such transfer might perhaps have been taken for granted, and indeed it might well be held undesirable to suggest the replacement of the certification "general "paralysis of the insane," which conveys more information, by that of "syphilis," which conveys less. The authors of the paper are, however, considering the advisability of discontinuing inquiry in this case.

The Minister of Trade and Customs of the Commonwealth of Australia recently appointed a Committee consisting of Sir H. B. Allen, M.D., Drs. Cumpston, Wood and Mr. J. Mathews (Chairman) to inquire into the causes of invalidity and death in the Commonwealth. This Committee has now issued a report devoted to the subject of tuberculosis which contains many statistical data of interest. Attention is directed to the great differences between the rates of mortality prevailing in the different states. In New South Wales the death-rate per 100,000 from all forms of tuberculosis has fallen from 153 in 1875 to 72 in 1914. In earlier years the rate was higher in the metropolitan than in the extra metropolitan districts but by 1914 the position was reversed. In Victoria the rate fell from 177 to 86, in South Australia from 120 to 75 and in Queensland from 173 to 48. In Queensland the extra metropolitan districts are still subject to a much lower rate than the metropolitan districts. The Committee remark that "if some fundamental explanation of "the reduction of tuberculosis in Queensland could be obtained, it "would go far towards elucidating many of the problems in the "control of the disease." It would have been convenient had it been possible to provide age-standardized figures for the separate States in view of the peculiar age incidence of the disease. This matter is, of course, considered in connection with the Commonwealth as a whole as well as the occupational distribution of mortality. Apart from the question of age standardization, another point to be borne in mind by statisticians who are tempted to tackle the problem propounded by the Committee, is the effect of immigration and possible changes of fashion as to the choice of a new home by delicate persons. It will be remembered that Dr. Hamer both in a presidential address to the Epidemiological Section of the Royal Society of Medicine and in recent annual reports to the London County Council, has dwelt upon the possible importance of immigration and emigration as factors of changing mortality rates, especially in the case of tuberculosis.

We have received a copy of the *Bulletin of the War Study Society* published by a "Society for the Study of the Social Consequences "of the War" which has its headquarters at Copenhagen. The bulletin, which is dated August 1, 1916, furnishes estimates of the direct losses of human life incurred by the belligerent powers during the first two years of the war. The authors conclude that 4,631,500 persons have been killed or died of wounds or disease contracted on active service, that 11,245,300 have been wounded and that 3,373,700 have been invalided. The losses of each belligerent are separately computed. It is of interest to notice that the authors reach totals of German losses during the first 23 months of war in very fair agreement with the estimates published by the English authorities. Thus the Danish Society estimates the German deaths as 771,308 while the English calculation is 757,327. This may not, of course, mean much more than that both groups of investigators have adopted similar methods of analysis, and since the data have in the majority of cases been deliberately published in such a way as to make it difficult or impossible to reach the truth, estimates are necessarily of very questionable value. The writers seem, however, to have taken pains to reach as accurate results as possible and the bulletin is of interest.

STATISTICAL AND ECONOMIC ARTICLES IN RECENT PERIODICALS.

UNITED KINGDOM—

Accountants' Magazine—

February, 1917—Trade after the War.

March, 1917—Trade after the War. Proposals to introduce Decimal Coinage and the Metric System.

Associated Accountants' Journal. January, 1917—Financial Theory and the Distribution of War Costs: *Jones* (*Prof. J. H.*). The Decimal System applied to British Coinage: *McConnel* (*Col. F. R.*). The Finance Act, 1909–10, and the Housing Question: *Rolleston* (*Sir J.*).

Bankers' Magazine—

January, 1917—The Progress of Banking in Great Britain and Ireland during 1916. (*Continued in later issues.*) The Great Crisis. xxx: A Survey of the Year. London Joint Stock Banks *vis-à-vis* Foreign Branch Banks. Currency Inflation Problems.

February, 1917—The Great Crisis. xxxi: New National Loan. Credit and Trade. The Position of the Enemy Banks. London Bankers' Clearings in 1916. The Enemy Banks in London.

March, 1917—The Great Crisis. xxxii: The Nation's Effort. Bankers on the Situation.

Economic Journal. March, 1917—The Conscription of Income: *Sprague* (*O. M. W.*). The Economics of the War Loan: *Pigou* (*Prof. A. C.*). Taxation of Excess Profits Abroad: *Stamp* (*J. C.*). Small Holdings and Corn Prices: *Ashby* (*A. W.*). The Remuneration of Women's Services: *Rathbone* (*Eleanor*).

Eugenics Review. January, 1917—Quality *not* Quantity: *Darwin* (*Major L.*). The Declining Birth-Rate: its Causes and Effects: *Chalmers* (*A. K.*). The Study of Heredity (Part IV): *McBride* (*Prof.*). La Misura dell' Intelligenza.

Financial Review of Reviews. March, 1917—The State and the Licensed Trade: *Wright* (*Arnold*). Government Control of Industries and Finance: *Quail* (*Jesse*). The Economic Future of our Allies: *Gardner* (*J.*). The War's Lesson for Investors: *Stiles* (*C. R.*). The Future of British Shipping: *Good* (*E. T.*).

Journal of the Institute of Bankers—

January, 1917—Modern Languages and Modern Business: *Sadler* (*M. E.*). Bankers' Guarantees: *Rainey* (*J. H.*). Bank of England Coupons: *Sharp* (*G. G.*).

February, 1917—German Trade Expansion: its Methods and its Tendencies: *Davidson* (*J. M.*). The Work of the London Bankers' Clearing House during the year 1916. Opening Branches of English Banks in France, Italy and Russia. Winding up the Enemy Banks in London: *Plender* (*Sir Wm.*).

UNITED KINGDOM—*Contd.*

Journal of the Institute of Bankers—Contd.

March, 1917—German Trade Expansion: its Methods and its Tendencies: *Davidson* (*J. M.*). On War Finance: *Holden* (*Sir Edward*). The Gilbart Lectures. 1917. Lecture 1: On Cheques: *Paget* (*Sir John, Bart.*).

Journal of Royal Meteorological Society. January, 1917—A Meteorologist in China: *Brooks* (*C. E. P.*). The Measurement of Rainfall Duration: *Salter* (*C.*). Discontinuities in Meteorological Phenomena: *Turner* (*Prof. H. H.*).

Journal of the Board of Agriculture—

January, 1917—Agriculture and the War. The Position of the German Stock Feeder. Food Supplies and Prices in War Time. War Food Societies. Notes on Feeding Stuffs in January.

February, 1917—Agriculture and the War. The Food Supply of the United Kingdom. Converting Pasture to Arable Cultivation: *Amos* (*A.*). Farming Accounts. Cost of Production. Exports of Agricultural Produce in 1916, and Miscellaneous Agricultural Imports.

Public Health—

January, 1917—The Prevention of Venereal Disease, with Special Reference to the Report of the Royal Commission: *Buchan* (*J. J.*). Some Problems connected with the Notification of Tuberculosis: *Weaver* (*A. E. R.*).

February, 1917—Maternity and Child Welfare Work: *White* (*Adam*). The Passing of Small-pox in Britain. To what is it due? *Millard* (*C. Killick*). Observations on the Recent Report of the Royal Commission on Venereal Diseases, and some of the Difficulties anticipated in carrying out Schemes of Treatment: *Robertson* (*John*).

Ireland. Journal of Department of Agriculture. January, 1917—The Vice-President's Address. The Scandinavian Methods of valuing and using Feeding Stuffs: *Wilson* (*J.*). The Cost of Producing Milk: *Wilson* (*J.*). Women Agricultural Workers in Germany. Food Production: 1917.

INDIA—

The Wealth of India—

December, 1916—The Tariff as a Source of Revenue: *Mukherjee* (*Prof. B.*). The Problem of the Poor: *Chandavarkar* (*G. A.*).

January, 1917—Some Economic Aspects of the War: *Dalal* (*R. D.*). Indian Currency and Finance: *The Editor*. The Industrial Development of India: *Roy Bahadur* (*Hon. R. S.*)

Indian Journal of Economics. September, 1916—The Indian Institute of Science, Bangalore: *Spring* (*Sir Francis*). The Indian Customs: *Barker* (*D. A.*). An Indian Trans-Asiatic Railroad: *Mathers* (*George S. A.*). Business Management as a University Study: *Jevons* (*H. Stanley*). A Preliminary Note on Pauperism in India: *Jain* (*Padam S.*). Agricultural Banks: *Wolff* (*Henry W.*).

UNITED STATES—

American Journal of Sociology—

November, 1916—Public Range Lands, a New Policy Needed: *Adams* (*Romanzo*). Redirection of Education in Small Cities and Towns of Washington. Vocational Instruction the Entering Wedge of Redirection: *Lull* (*Herbert G.*). Social Progress and the Purposeful Utilization of the Surplus: *Sims* (*Newell L.*). Rating the Nations: A Study in the Statistics of Opinion: *Woolston* (*Howard B.*). The House-Court Problem: *Bogardus* (*Emory S.*).

January, 1917—The teaching of Rural Sociology: particularly in the land-grant Colleges and Universities: *Sanderson* (*Dwight*). Class and Caste. 1. The rise of gross inequalities: *Ross* (*Edward A.*). The human element in production: *Valentine* (*Robert G.*). The need of a socialized jurisprudence: *Speck Peter* (*A.*). The earlier German nationalism in America: *Maurer* (*Heinrich H.*).

Annals of American Academy of Political and Social Science. January, 1917—Containing a series of Papers by different authors dealing with the Present Labour Situation grouped under the following heads:—Parts 1. Certain aspects of the Labour Situation; 2. Wages, Working Conditions and Hours of Labour; 3. Public Employment Bureaus; 4. Some aspects of Collective Bargaining; 5. Compulsory Arbitration or Investigation before Strikes or Lockouts; 6. Voluntary Arbitration and Conciliation in Private Businesses; 7. Fixing Hours and Wages in the Railroads and other Public Utilities.

Bankers' Magazine (*New York*)—

December, 1916—Government Control of Business: *Coolidge* (*Louis A.*). The Recent Growth of Banking in the United States: *Youngman* (*Elmer H.*).

January, 1917—The High Cost of Living: *Cummings* (*John R.*). Opportunities for American Banking. Trade and Enterprise in Mediterranean Countries: *Zaldari* (*Petros G.*). Guatemala: Its Commercial and Financial Possibilities: *Clausen* (*John*).

February, 1917—Opportunities for American Banking. Trade and Enterprise in Greece: *Zaldari* (*P. G.*).

Journal of Political Economy—

December, 1916—The Economics and Legality of Premium Giving: *Duncan* (*C. S.*). The Organization of Workmen's Compensation Insurance: *Downey* (*E. H.*). The Parisian Bill Market in the Seventeenth Century: *Usher* (*Abbott P.*). The War and the International Mercantile Marine Company *Saliers* (*Earl A.*).

January, 1917—Contains a series of Papers by different authors on Problems of Economic Instruction, grouped under the following heads:—1. Undergraduate Courses in Economics 2. Graduate works in Economics; 3. Economics and Allied Fields.

UNITED STATES—*Contd.*

Quarterly Journal of Economics. February, 1917—Climatic Change and Agricultural Exhaustion as Elements in the Fall of Rome: *Huntington (Ellsworth).* The Separation of Railroad operating expenses between Freight and Passenger Service: *Cunningham (William J.).* Work and Pay: A Suggestion for Representative Government in Industry: *Valentine (Robert G.)* and *Tead (Ordway).* The German Steel Syndicate: *Tosdal (H. R.).* Total Utility and Consumers' Surplus under varying Conditions of the Distribution of Income: *Wright (Philip G.).*

Quarterly Publications of American Statistical Association. December, 1916—A Study in Social Dynamics: A Statistical Determination of the Rate of Natural Increase and of the Factors Accounting for the increase of Population in the United States: *Gillette (John M.).* Forty-five Years of U.S. Naval Morbidity Statistics of Degenerative Disorders: *Fiske (Charles N.).* Florence Nightingale as Statistician: *Kopf (Edwin W.).* Consumption of Gas as affected by Population: *Watkins (G. P.)* and *Lubarsky (L. H.).* Interpolation of Ordinates and Areas among Areas: *Forsyth (C. H.).* Charters for American Business Corporations in the Eighteenth Century: *Davis (Joseph S.).* The Application of Statistics to Advertising and Marketing: *Roth (Hyman L.).*

Yale Review. January, 1917—The Railroads and the People: *Fagan (James O.).* The Adamson Law: *Clapp Edwin (J.).* Reflections on the War: *Cromer (Earl of).* Mexico: A Review and a Forecast: *Barrett (John).*

CUBA— .

La Reforma Sociale—

October, 1916—El desarrollo de la estadística demográfica en Cuba: *Le Roy (Dr. Jorge).* La immigración jamaiquina: *Pérez (Luis).*

November, 1916—El problema social y el Derecho civil: *Azcárate (Gumersindo).* La estadística demográfica en Cuba: *Le Roy y Cassá (Jorge).*

December, 1916—La Dactiloscopiá: *Lugo (Luis).* Bibliografiá de la estadística en Cuba: *Le Roy (Jorge).*

EGYPT—

L'Egypte Contemporaine. February, 1917—La procédure d'exécution immobilière en Égypte: *Pezzi Bey (E.).* La notion moderne de l'allégeance et le régime qu'il convient d'appliquer à la nouvelle nationalité égyptienne: *Dahan (C.).*

FRANCE—

Bulletin de Statistique et de Législation Comparée—

November, 1916—La production des alcools en 1915 et 1914. Les revenus de l'État.

FRANCE—*Contd.*

Bulletin de Statistique et de Législation Comparée— Contd.

December, 1916—Les fabriques de sucre et leurs procédés de fabrication (campagne 1915–1916). Statistique des fabriques entrepôts, magasins de vente en gros, magasins de vente au détail, etc., soumis, en 1915, aux exercices des agents des contributions indirectes. Les revenus de l'État.

January, 1917—Rapport du Ministre des finances, concernant l'émission de rentes 5 per cent. (1915). Les produits de l'enregistrement, des domaines et du timbre, constatés et recouvrés, en France, pendant l'exercice 1913. Suisse: Le budget de l'exercice 1917.

Journal des Economistes—

January, 1917—Le Dilemme: *Guyot (Yves).* Revue du marché financier en 1916: *Raffalovich (A.).* Les Multiples Projets de réforme de notre loi des inventions et le Brevet interalliés: *Jacq (Fernand).* Le Bien de famille rural avant la guerre et après la guerre: *Beckerich (Abel).* La Majoration des tarifs de chemins de fer: *Guyot (Yves).* Nouvelle Législation espagnole sur les syndicats industriels: *P. de M.* Les États-Unis pendant la guerre: *Levy (Raphael G.).*

February, 1917—L'Aliment alcool et le Péril antialcoolique: *Guyot (Yves).* Le Synchronisme hebdomadaire. L'Année économique. Le Septénaire et la Quatriseptènaire: *Delaporte (Paul).* Sur les monopoles et industries d'État: *Schelle (Gustave).* La Vie chère dans la zone des armées. Les Mesures prises pour la combattre: *Cauboue (Pierre).* L'impôt complémentaire sur le revenu. Les Dernières Modifications législatives: *Falck (Etienne).* Mouvement scientifique et industriel: *Bellet (Daniel).* Le Japon. Sa situation financière et économique (1915–1916): *Nouvion (Georges de).* Le Blocus moral de l'Allemagne et les sous-marins: *N. M.* Note sur les obligations quinquennales de la Défense nationale: *Barriol (A.).*

Journal de la Société de Statistique de Paris—

January, 1917—Le commerce de l'Italie durant les quinze dernières années: *Meuriot (Paul).* Nécrologie. Paul Leroy-Beaulieu: *Schelle (M.).*

February, 1917—Le déficit de la population dans les régions montagneuses: *Descombes (Paul).* Étude statistique sur le change en Espagne en 1916: *Barthe (André).* Chronique de démographie: *Huber (Michel).*

La Réforme Sociale—

January, 1917—Comment fut fondée la Réforme Sociale: *Béchaux (A.).* Soixante ans d'enquêtes et de doctrine: *Du Maroussem (P.).* La culture du blé et la taxation: *de Poncins (Vicomte C.).* Le mouvement économique et social: Allemagne, Autriche-Hongrie: *Blondel (G.).*

FRANCE—*Contd.*

La Réforme Sociale—Contd.

February, 1917—La réparation des dommages de guerre : *Damez* (*Alfred*). Quelques idées étranges en matière d'impôts : *Valleroux* (*Hubert*). Les douzièmes provisoires de 1917 : *Falck* (*Etienne*). Le mouvement économique et social : Pays de langue anglaise : *Rotours* (*Baron J. des*).

Revue d'Economie Politique. September–December, 1916—De la nécessité pour la France d'accroître sa production : *Gide* (*Charles*). L'histoire du socialisme en Italie et les influences germaniques : *Bellet* (*Daniel*). Le mouvement coopératif en Espagne : *X.* L'économie politique et la guerre : *Gonnard* (*René*). La réforme du tarif douanier après la guerre. Les soies ouvrées de provenance italienne : *Eisenchadt* (*Anna Vera*). La question de la dépopulation : *X.*

Revue des Nations Latines—

January, 1917—Les communications par chemin de fer entre la France et l'Italie : *Honnorat* (*A.*).

February, 1917—La Guerre et le Socialisme : *Bourgin* (*Hubert*).

March, 1917—La hausse des prix pendant et après la guerre : *Bourier* (*Emile*).

ITALY—

Giornale degli Economisti e Rivista di Statistica—

December, 1916—Il costo della guerra : *Amoroso* (*Luigi*). Nazionalismo economico e rincaro del capitale : *Prato* (*Giuseppe*). Sull' evasione nelle trasmissioni gratuite mobiliari : *Contento* (*Aldo*).

January, 1917—Il contributo regionale di ufficiali di fanteria durante la guerra : *Livi* (*Livio*). La speculazione nelle trasmissioni nelle borse dei prodotti agricoli e le recenti esperienze del commercio granario : *Garino-Canina* (*Attilio*).

February, 1917—L'Industria italiana dell' armamento navale in economia di guerra : *Nobili-Massuero* (*Ferd*). Sull' evasione nelle trasmissioni gratuiti mobiliari : *Contento* (*Aldo*). Dati sul costo dell' alimentazione.

La Riforma Sociale. January–February, 1917—Cenni sulle migrazioni e sul movimento di popolazione durante la guerra europea : *Michels* (*Roberto*). I redentori delle terre incolte : *Prato* (*Giuseppe*). Esiste ancora il commercio internationale durante la guerra ? *Porri* (*Vincenzo*). I "Cicli degli affari" : *Borgatta* (*Gino*).

Rivista Italiana di Sociologia. September–December, 1916—L'organizzazione scientifica del lavoro mentale : *De Sanctis* (*S.*). Sull' aumento di mortalità determinato dalla guerra : *Gini* (*C.*). Controversie sulla prima cattedra di scienza economica : *Michels* (*R.*). La protezione del fanciullo nella legislazione inglese : *Bassi* (*G.*).

DENMARK—

Nationaløkonomisk Tidsskrift—

July–October, 1916—Handelspolitiske Strømninger. 1: Tyskland-Østerrig-Ungarn: *Toftegaard* (*Jens*). Kjøbenhavnske Boligforhold: *Røgind* (*Sven*). Økonomiske Oversigter. Danmark: *Cohn* (*Einar*).

November–December, 1916—Danmarks Financielle Forhold til Udlandet: *Henriques* (*O.*). Ententens Ernaæringsproblemer: *Kaarsen* (*A. C.*).

SPAIN—

Revista Nacional de Economia. December, 1916–*January*, 1917—El problema de las subsistencias: *Riu* (*Emilio*). Los ferrocarriles españoles: *Quijano* (*Pedro M. G.*). La liquidacion del Presupiesto del Estado: *Ribera* (*Arturo F.*). La construcción de máquinas en España: *Ventosa* (*José Durán y*). Informaciones regionales: Crónica comercial y bursátil de la plaza de Barcelona: *Kirchner* (*F.*). Cronica economica y financiera de Bilbao: *Carabias* (*Julio*). Las subsistencias en Asturias: *Viar* (*J. Aguirre de*). El trabajo salmantino y la guerra: *Cardenal* (*Andrés P.*). Las subsistencias en Valencia: *L. B.* Alimentación del peublo en Alemania durante la guerra: *Gay* (*Vicente*). La Marina mercante y los fletes en 1916: *Olivares* (*A. G.*) La Economia politica en sus relaciones con la guerra: *Graell* (*Guillermo*). Los ferrocarriles en Chile: *Martner* (*Daniel*).

LIST OF ADDITIONS TO THE LIBRARY.

During the period that has elapsed since January, 1917, the Society has received the publications enumerated below.

Note.—Periodical publications are not included in this list, but they will be acknowledged at the end of the volume.

(a) Foreign Countries.

Denmark—

Iceland.

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PERIODICAL RETURNS.

REGISTRATION OF THE UNITED KINGDOM.

No. I.—ENGLAND AND WALES.

MARRIAGES, BIRTHS AND DEATHS—To 31st December, 1916.

A.—*Serial Table of* Marriages, Births, *and* Deaths, *returned in the Years* 1916-1910, *and in the* Quarters *of those Years.*

Calendar Years, 1916-1910 :—*Numbers.*

Years.........	1916.*	'15.	'14.	'13.	'12.	'11.	'10.
Marriages No.	279,227	360,885	294,401	286,583	283,834	274,943	267,721
Births........ ,,	785,454	814,614	879,096	881,890	872,737	881,138	896,962
Deaths .... ,,	508,227	562,253	516,742	504,975	486,939	527,810	483,247

Quarters *of each Calendar Year,* 1916-1910.

(I.) Marriages:—*Numbers.*

Qrs. ended last day of	1916.	'15.	'14.	'13.	'12.	'11.	'10.
March........ No.	67,837	55,472	51,046	60,926	44,737	44,808	56,432
June .... ,,	74,461	97,220	81,312	65,904	74,619	75,656	61,036
September ,,	67,361	102,671	82,048	83,636	83,505	77,873	76,545
December ,,	69,568	105,522	79,995	76,117	80,973	76,606	73,708

(II.) Births:—*Numbers.*

Qrs. ended last day of	1916.	'15.	'14.	'13.	'12.	'11.	'10.
March........ No.	194,941	221,523	217,414	216,629	222,600	223,585	221,684
June .... ,,	209,018	213,109	226,152	227,470	218,070	225,774	234,825
September ,,	198,286	196,501	227,238	225,501	219,232	222,506	227,146
December ,,	183,209	183,481	208,292	212,290	212,835	209,273	213,307

(III.) Deaths:—*Numbers.*

Qrs. ended last day of	1916.	'15.	'14.	'13.	'12.	'11.	'10.
March........ No.	142,993	177,243	146,193	146,541	144,642	143,128	136,400
June .... ,,	126,545	138,575	124,128	121,743	115,777	119,966	115,671
September ,,	102,441	109,406	115,535	113,446	101,680	140,949	104,149
December ,,	136,248	137,029	130,886	123,245	124,840	123,767	127,027

* Provisional.

Annual Rates of MARRIAGES, BIRTHS, *and* DEATHS, *per* 1,000 PERSONS LIVING *in the Years* 1916-1910, *and in the* QUARTERS *of those Years.*

Calendar YEARS, 1916-1910:—*General Ratios.*

YEARS	1916.†	Mean 1906-'15.	1915 ‡	14.	'13	'12.	'11.	'10.
Estmtd. Popln. of England and Wales *in thousands* in middle of each Year*	—	—	35,359, (Civilians only.)	36,961,	36,606,	36,382,	36,190,	35,792,
Persons Married	15·4	15·8	19·5	15·9	15·7	15·6	15·2	15·0
Births	21·6	24·9	22·0	23·8	24·1	23·9	24·3	25·1
Deaths	14·0	14·5	15·7	14·0	13·8	13·3	14·6	13·5

QUARTERS *of each Calendar Year*, 1916-1910.

(I.) PERSONS MARRIED:—*Ratio per* 1,000.

Qrs. ended last day of	1916.	Mean 1906-'15	1915.	'14.	13.	'12.	'11.	'10.
March	15·0	11·4	12·2	11·2	13·5	9·9	10·0	12·8
June	16·5	16·7	21·1	17·6	14·4	16·5	16·8	13·7
September	14·7	17·9	22·0	17·6	18·1	18·2	17·1	17·0
December	15·2	17·3	22·7	17·2	16·5	17·7	16·8	16·3

(II.) BIRTHS:—*Ratio per* 1,000.

Qrs. ended last day of	1916.	Mean 1906-'15.	1915.	'14.	'13.	'12.	'11.	'10.
March	21·6	25·5	24·3	23·9	24·0	24·5	25·1	25·1
June	23·1	25·8	23·1	24·5	24·9	24·0	25·0	26·3
September	21·7	24·9	21·1	24·4	24·4	23·9	24·4	25·2
December	20·1	23·5	19·7	22·4	23·0	23·2	22·9	23·6

(III.) DEATHS:—*Ratio per* 1,000.

Qrs. ended last day of	1916.	Mean 1906-'15.	1915.	'14.	'13.	'12.	'11.	'10.
March	15·8	17·1	20·1	16·0	16·2	15·9	16·0	15·5
June	14·0	13·9	15·4	13·5	13·3	12·8	13·3	13·0
September	11·2	12·7	12·1	12·4	12·3	11·1	15·5	11·5
December	14·9	14·3	15·1	14·0	13·4	13·6	13·6	14·1

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* The estimated population in 1910 is based on the Censuses of 1901 and 1911. The estimates for 1911-14 are based upon the Census of 1911 and the returns of births, deaths, and migration; and that for 1915 upon the results obtained under the National Registration Act, 1915.

† Rates in 1916 are based upon an assumed total population of 36,250,000 in the middle of 1915.

‡ Marriage- and Birth-rates in 1915 are based upon the estimated total population in 1914. Death-rates relate to civilians only, and are based upon the estimated civil population in 1915.

B.—*Special Town Table:*—POPULATION; BIRTH-RATE *and Civilian* DEATH-RATE *in each Quarter of* 1916, *in certain of the* NINETY-SIX *Large Towns.*

Cities and boroughs.	Estimated Civil population in 1915.	Annual Rate to 1,000 Living during the thirteen weeks ending							
		April 1, 1916. (1st quarter.)		July 1, 1916. (2nd quarter.)		Sept. 30, 1916. (3rd quarter.)		Dec. 30, 1916. (4th quarter.)	
		Births.	Deaths.	Births.	Deaths.	Births.	Deaths.	Births.	Deaths.
Ninety-six towns	17,312,295	21·9	16·5	23·2	14·3	21·8	11·4	20·3	15·6
Including—									
London	4,310,030	22·1	16·0	23·7	13·8	21·4	11·1	20·7	16·2
West Ham	294,396	28·6	16·1	28·6	14·3	26·5	11·8	24·8	15·1
Croydon	177,345	19·6	13·4	19·8	11·2	18·9	10·0	17·2	13·5
Brighton	118,286	18·8	17·4	20·3	12·7	18·2	13·0	16·7	17·8
Portsmouth	202,441	24·2	15·9	24·4	13·9	25·2	11·5	22·8	15·7
Bristol	352,859	19·0	15·5	20·9	13·0	20·9	10·4	18·0	15·3
Cardiff	184,900	21·8	15·1	24·7	12·9	23·7	10·7	20·2	14·1
Swansea...............	110,843	23·5	20·6	25·6	15·4	23·1	11·1	20·0	12·8
Wolverhampton	94,968	23·5	16·1	23·0	13·5	21·8	12·8	22·8	15·6
Birmingham	864,545	21·8	16·0	23·2	14·8	23·7	10·5	21·2	14·1
Norwich	115,902	19·4	16·2	23·1	14·1	20·0	11·5	18·2	19·0
Leicester	225,907	18·8	16·7	21·5	13·6	19·8	9·6	18·9	13·7
Nottingham	240,588	19·7	17·7	21·9	15·5	19·2	12·4	19·4	16·7
Derby	119,072	20·2	16·7	21·6	14·0	21·2	10 8	19·6	15·5
Birkenhead	134,913	27·3	16·6	28·4	13·9	26·7	11·8	23·9	15·5
Liverpool	740,162	26·9	22·4	26·6	17·0	26·5	15·5	24·5	19·6
Bolton	172,514	16·9	16·0	17·9	13·8	16·3	10·8	15·5	14·5
Manchester	700,319	22·5	17·0	22·7	16·2	21·3	12·2	19·3	16·6
Salford	219,979	21·5	16·7	23·2	14·8	21·3	11·5	19·6	15·7
Oldham...............	141,781	18·6	18·5	19·2	16·2	18·1	12·4	16·3	16·3
Burnley................	103,098	17·1	20·0	16·8	17·3	18·1	11·6	14·5	17·2
Blackburn...........	127,443	17·6	15·9	15·7	14·3	15·0	10·4	14·7	14·9
Preston	111,936	18·6	17·7	22·1	16·1	18·5	11·8	17·7	17·5
Huddersfield ...	111,139	16·2	16·8	17·4	14·8	15·9	12·9	15·5	14·5
Halifax	99,497	15·0	15·9	15·5	15·1	15·8	10·9	14·1	15·9
Bradford	280,737	16·4	17·0	18·1	14·2	16·7	12·1	15·6	16·4
Leeds..................	446,349	20·7	16·9	21·6	15·7	20·5	12·9	17·6	15·9
Sheffield	476,012	23·7	17·5	24·7	15·5	23·8	11·9	23·3	15·6
Hull	269,530	25·0	18·8	23·2	15·4	24·4	13·5	19·6	14·9
Sunderland	148,273	26·6	18·8	27·9	20·7	25·2	13·9	25·1	18·0
Gateshead...........	120,830	27·2	17·7	29·1	19·7	26·5	14·8	24·6	18·9
Newcastle-on-Tyne	278,107	24·9	16·8	26·6	16·6	25·0	12·2	22·7	15·7

Note.—The 96 great towns are those with populations exceeding 50,000 persons at the Census of 1911. The birth-rates are based upon births actually registered in the several towns and upon total populations estimated to the middle of 1916. The death-rates are based upon civilian deaths and upon the estimated civilian population in 1915. The death-rate in London has been corrected as far as possible (1) by excluding deaths of all non-residents, and (2) by including the deaths of London residents occurring in the Metropolitan outer ring or in Metropolitan public institutions situated outside the County. The death-rates in the other towns have been corrected, as far as possible (1) by the exclusion of all deaths of non-residents, and (2) by the inclusion of deaths of residents in certain outlying public institutions. With regard to the outer ring and its constituent areas, however, correction is more complete, a distribution of all transferable deaths occurring in any part of Greater London having been made.

C.—*Comparative Table of* CONSOLS, PROVISIONS, COAL, *and* PAUPERISM *in each* QUARTER *of* 1914-15-16.

Cols...	1	2	3	4			5			6	7	8
	Average prices of										PAUPERISM ‖	
Quarter ended	2½*l.* per cent. CONSOLS (for money) per 100*l.* Stock.*	Average minimum rate per cent. of DISCOUNT charged by the Bank of England.*	WHEAT per quarter.†	Price per pound at the Metropolitan Cattle Market (sinking the offal).‡						Average price of seaborne COAL per ton in the London market.§	Average number of PAUPERS relieved on the *last day* of each week.	
				Beef.			Mutton.				In-door.	Out-door.
				Inferior quality.	Second quality.	First quality.	Inferior quality.	Second quality.	First quality.			
1914	£ *s.* *d.*	£	*s.* *d.*	*d.*	*d.*	*d.*	*d.*	*d.*	*d.*	*s.* *d.*		
Mar. 31	74 15 8	3·47	31 1	5⅜	6⅝	8	6½	9⅛	10⅞	21 0	265,791	377,982
June 30	74 18 0	3·00	32 9	5½	6¾	7⅞	6⅛	8½	10	21 0	252,721	372,559
Sept. 30	74 16 2¶	4·66	36 3	4⅞	7¼	8¼	7	9⅛	10⅜	**	249,484	383,627
Dec. 31	¶	5·00	39 11	5⅛	7¼	8½	7⅛	8⅞	10⅜	**	256,057	379,437
1915												
Mar. 31	68 5 5	5·00	52 5	5⅝	8⅜	9½	7¾	9⅜	11⅛	**	255,818	379,469
June 30	66 8 4	5·00	58 1	7⅝	9½	10⅞	8¾	10½	11⅞	**	234,944	366,057
Sept. 30	65 0 11	5·00	49 8	7⅝	10⅛	11⅞	8¼	10⅛	11½	**	221,902	352,005
Dec. 31	62 3 9	5·00	51 5	6½	8⅝	10	7¾	9½	11⅛	**	223,562	340,867
1916												
Mar. 31	58 4 0	5·00	57 1	6½	8⅜	10⅛	9⅜	11¼	12⅞	**	225,899	336,066
June 30	58 0 3	5·00	52 7	9½	11⅝	13¼	11⅜	13	14½	**	215,033	322,259
Sept. 30	59 14 5	5·87	55 9	9⅛	11⅜	12¾	10½	12⅛	13⅝	**	208,794	311,315
Dec. 31	56 2 2	6·00	68 2	8⅜	10¾	12⅜	10½	12¾	14⅜	**	212,653	305,443

* The price of Consols and the Rate of Discount are furnished by the Chief Cashier of the Bank of England.

† As published by the Board of Agriculture.

‡ Furnished by the Board of Agriculture.

§ Furnished by the Mining Statistics Branch of the Home Office.

‖ For the several quarters of the year 1916, the average numbers of paupers have been based upon the numbers relieved on the last Saturday in each month.

¶ This amount relates to the month of July only, no official quotation having been obtainable for August and September owing to the closing of the Stock Exchange. The Stock Exchange remained closed during the quarter ended December 31, 1914, and no official prices were therefore recorded, but the minimum price at which transactions in this security were allowed by the Stock Exchange Committee was 68*l.* 10*s*.

** No quotations.

No. II.—SCOTLAND.

BIRTHS, DEATHS, AND MARRIAGES, IN THE YEAR ENDED 31ST DECEMBER, 1916.

I.—*Serial Table:—Number of* BIRTHS, DEATHS, *and* MARRIAGES *in Scotland, and their Proportion to the Population estimated to the Middle of each Year, during each Quarter of the Years* **1916-1912** *inclusive.*

	1916.		1915.		1914.		1913.		1912.	
	Number.	Per 1,000	Number.	Per 1,000.	Number.	Per 1,000.	Number.	Per 1,000.	Number.	Per 1,000.
1st Quarter—										
Births	27,353	22·8	31,008	26·3	30,656	26·3	29,825	25·6	30,272	25·6
Deaths	19,516	16·3	24,981	21·2	20,654	17·7	21,270	18·2	20,671	17·5
Marriages	8,604	7·2	7,993	6·8	8,631	7·4	7,841	6·7	6,994	5·9
2nd Quarter—										
Births	29,930	25·0	30,809	25·8	33,009	28·0	32,198	27·3	32,221	27·3
Deaths	18,265	15·2	20,414	17·1	18,169	15·4	18,143	15·4	17,728	15·0
Marriages	7,635	6·4	9,241	7·8	9,088	7·7	8,503	7·2	8,209	7·0
3rd Quarter—										
Births	27,143	22·4	26,797	22·2	30,336	25·5	29,487	24·7	30,166	25·3
Deaths	15,026	12·4	15,929	13·2	16,219	13·6	16,194	13·6	15,219	12·8
Marriages	7,766	6·4	9,643	8·0	9,358	7·9	9,037	7·6	8,778	7·4
4th Quarter—										
Births	25,509	21·0	25,589	21·2	29,933	25·1	29,006	24·3	30,057	25·2
Deaths	17,835	14·7	20,304	16·8	18,515	15·5	17,462	14·6	18,729	15·7
Marriages	7,474	6·2	9,385	7·8	7,972	6·7	8,310	7·0	8,529	7·1
Year—										
Population	4,824,308		4,785,598		4,747,167		4,728,132		4,741,077	
Births	109,935	22·8	114,203	23·9	133,934	26·1	120,516	25·5	122,716	25·9
Deaths	70,642	14·6	81,628	17·1	73,557	15·5	73,069	15·5	72,337	15·3
Marriages	31,479	6 5	36,265	7·6	35,019	7·4	33,691	7·1	32,510	6·9

II.—*Special Average Table:—Number of Births, Deaths, and Marriages in Scotland and in the divisions of the counties during each Quarter of* 1916, *and their proportion to the population.*

Registration group of districts.	Total Births.		Deaths.		Marriages.	
	Number.	Per 1,000 of population.	Number.	Per 1,000 of population	Number.	Per 1,000 of population.
1*st Quarter*—SCOTLAND	27,371	22·8	19,517	16·3	8,602	7·2
Northern division	414	17·1	463	19·1	116	4·8
North Western div....	645	17·0	684	18·0	203	5·3
North Eastern div.	2,428	21·7	1,875	16·7	746	6·7
East Midland div.	3,635	20·5	2,871	16·2	1,185	6·7
West Midland div.	2,115	22·1	1,474	15·4	470	4·9
South Western div....	13,768	25·9	8,647	16·3	4,296	8·1
South Eastern div.	3,514	19·9	2,690	15·2	1,346	7·6
Southern div.	852	19·2	813	18·3	240	5·4
2*nd Quarter*—SCOTLAND	29,928	25·0	18,261	15·2	7,633	6·4
Northern division ...	435	17·9	404	16·6	107	4·4
North Western div. ..	690	18·1	729	19·2	182	4·8
North Eastern div. ...	2,633	23·5	1,529	13·6	747	6·7
East Midland div. ...	3,992	22·6	2,570	14·5	920	5·2
West Midland div. ...	2,328	24·3	1,416	14·8	414	4·3
South Western div.....	14,848	28·0	8,159	15·4	3,669	6·9
South Eastern div. ...	4,009	22·7	2,608	14·8	1,317	7·5
Southern div.	993	22·3	759	17·1	277	6·2
3*rd Quarter*—SCOTLAND	27,150	22·4	15,024	12·4	7,762	6·4
Northern division	425	17·3	367	15·0	101	4·1
North Western div.....	642	16·7	503	13·1	174	4·5
North Eastern div.	2,470	21·8	1,318	11·6	609	5·4
East Midland div.	3,567	19·9	2,127	11·9	980	5·5
West Midland div.	2,080	21·5	1,166	12·0	439	4·5
South Western div.....	13,545	25·2	6,702	12·5	3,908	7·3
South Eastern div.	3,512	19·7	2,112	11·8	1,324	7·4
Southern div.	909	20·2	572	12·7	227	5·1
4*th Quarter*—SCOTLAND	25,509	21·0	17,835	14·7	7,474	6·2
Northern division	431	17·6	369	15·0	113	4·6
North Western div. ..	659	17·1	561	14·6	184	4·8
North Eastern div. ...	2,335	20·6	1,696	15·0	693	6·1
East Midland div.	3,326	18·6	2,789	15·5	1,006	5·6
West Midland div.....	1,960	20·3	1,262	13·0	420	4·3
South Western div.....	12,649	23·6	7,918	14·8	3,476	6·5
South Eastern div.	3,321	18·6	2,398	13·4	1,288	7·2
Southern div.	828	18·4	704	15·7	293	6·5

Population of Scotland.

Population.	Scotland.	Northern division.	North Western division.	North Eastern division.	East Midland division.	West Midland division.	South Western division.	South Eastern division.	Southern division.
By Census of 1911	4,760,904	105,997	164,636	467,333	712,146	386,312	2,033,521	700,577	190,382
Estimated to middle of 1916	4,822,200	97,600	152,900	450,800	711,800	385,000	2,135,000	710,400	178,700

No. III.—IRELAND.

IRELAND.—*Number of Births, Deaths and Marriages in each Province for each Quarter of* 1916 *and their Proportion to the Population.*

Provinces.	Births.		Deaths.		Marriages.*	
	Number.	Annual rate per 1,000 of population.	Number.	Annual rate per 1,000 of population.	Number.	Annual rate per 1,000 of population.
1st quarter—						
Leinster	6,352	21·9	5,945	20·5	1,778	6·1
Munster	5,429	21·0	4,595	17·7	1,062	4·1
Ulster	8,724	22·1	7,687	19·4	2,411	6·1
Connaught	3,113	20·4	2,419	15·8	536	3·5
Ireland	23,618	21·6	20,646	18·9	5,787	5·3
2nd quarter—						
Leinster	6,267	21·6	5,792	19·9	1,867	6·4
Munster	5,708	22·0	4,473	17·3	2,248	8·7
Ulster	8,872	22·4	7,108	18·0	2,202	5·6
Connaught	3,195	20·9	2,150	14·1	1,031	6·7
Ireland	24,042	22·2	19,523	18·0	7,348	6·8
3rd quarter—						
Leinster	6,228	21·4	4,234	14·6	1,143	3·9
Munster	5,232	20·2	3,228	12·5	1,042	4·0
Ulster	8,252	20·9	5,332	13·5	1,973	5·0
Connaught	3,130	20·5	1,811	11·9	529	3·5
Ireland	22,842	21·1	14,605	13·5	4,687	4·3
4th quarter—						
Leinster	5,749	19·8	5,043	17·4	1,684	5·8
Munster	4,813	18·6	3,661	14·1	956	3·7
Ulster	7,491	18·9	6,170	15·6	2,137	5·4
Connaught	2,963	19·4	1,880	12·3	466	3·1
Ireland	21,016	19·4	16,754	15·5	5,243	4·8
Total	91,518	—	71,528	—	23,065	—

* For the preceding quarter.

Population of Ireland.

	Leinster.	Munster.	Ulster.	Connaught.	Ireland.
By census of 1911	1,162,044	1,035,495	1,581,696	610,984	4,390,219
Estimated to middle of 1916	—	—	—	—	4,337,000

IRELAND.

	Births.		Deaths.		Marriages.*	
	Number.	Annual rate per 1,000 persons.	Number.	Annual rate per 1,000 persons.	Number.	Annual rate per 1,000 persons.
1st quarter, 1916—						
Total rural districts	14,797	20·0	13,359	18·0	—	
Total urban districts	8,821	24·7	7,287	20·4	—	
Dublin co. borough	2,327	—	1,973	—	677	
Belfast co. borough	2,656	—	1,863	—	833	
2nd quarter—						
Total rural districts	15,458	20·9	12,847	17·4	—	
Total urban districts	8,584	24·0	6,676	18·7	—	
Dublin co. borough	2,156	—	1,966	—	637	
Belfast co. borough	2,573	—	1,680	—	622	
3rd quarter—						
Total rural districts	14,570	19·7	9,519	12·9	—	
Total urban districts	8,272	23·2	5,086	14·2	—	
Dublin co. borough	2,175	—	1,470	—	433	
Belfast co. borough	2,271	—	1,335	—	714	
4th quarter—						
Total rural districts	13,662	18·5	10,646	14·4	—	
Total urban districts	7,354	20·6	6,108	17·1	—	
Dublin co. borough	1,904	—	1,790	—	652	
Belfast co. borough	2,039	—	1,579	—	797	

* For the preceding quarter.

No. IV.—GREAT BRITAIN AND IRELAND.

SUMMARY *of* MARRIAGES, *in the Year ended* 30*th September*, 1916; *and of* BIRTHS *and* DEATHS, *in the Year ended* 31*st December*, 1916.

(Compiled from the Quarterly Returns of the respective Registrars-General.)

Countries.	[000's omitted]		Marriages.	Per 1,000 of population.	Births.	Per 1,000 of population.	Deaths.	Per 1,000 of population.
	Area in statute acres.	Population middle estimated.						
		No.	No.	Ratio.	No.	Ratio.	No.	Ratio.
England and Wales	37,338,		315,181	15·4*	785,454	21·6	508,227	14·0
Scotland	19,070,		33,390		109,935		70,642	
Ireland	20,345,		23,065		91,518		71,528	
Great Britain and Ireland	76,753,		371,129		986,907		650,397	

* Rate for the year ended December 31st, 1916.

Trade of United Kingdom, 1916-1915-1914.—*Declared Real Value (Ex-duty) of* **Imports** *at Port of Entry, and therefore including Freight and Importer's Profit; and the Distribution of* **Exports** *of British and Irish Produce and Manufactures from the United Kingdom, according to their Declared Real Value.*

Merchandise (*excluding Gold and Silver*) Imported from, and Exported to, the following Foreign Countries, &c.	[000's omitted.] 1916.		1915.		1914.	
	Imports from	*Exports to*	Imports from	*Exports to*	Imports from	*Exports to*
	£	£	£	£	£	£
Russia	18,305,	24,991,	21,429,	13,290,	28,120,	13,863,
Sweden	20,597,	6,581,	19,818,	6,290,	14,199,	7,723,
Norway	16,674,	10,891,	13,692,	7,314,	7,628,	6,493,
Denmark*	21,945,	11,430,	22,597,	8,037,	25,373,	5,834,
Germany†	103,	—	201,	138,	46,928,	23,075,
Holland	22,187,	24,056,	23,440,	19,130,	24,338,	13,365,
Java	14,514,	7,101,	12,216,	5,181,	12,320,	5,349,
Belgium†	1,292,	256,	1,576,	187,	16,104,	8,263,
France†	26,648,	93,095,	31,470,	72,638,	37,792,	25,861,
Portugal†	5,272,	4,102,	3,975,	4,744,	3,174,	2,762,
Spain†	25,022,	8,524,	18,933,	7,471,	14,125,	6,386,
Italy†	11,276,	20,455,	11,268,	13,954,	8,716,	12,862,
Austria-Hungary	7,	—	43,	—	4,393,	2,668,
Greece	4,637,	1,265,	3,943,	2,475,	2,385,	2,895,
Roumania	—	46,	5,	487,	3,233,	1,938,
Turkey (European and Asiatic) and Crete	902,	433,	1,320,	374,	4,052,	5,895,
Egypt‡	—	—	—	—	17,098,	7,752,
Philippine Islands and Guam	4,006,	485,	2,130,	565,	1,615,	789,
China§	18,335,	10,699,	7,066,	8,548,	4,780,	12,990,
Japan‖	12,491,	7,501,	9,414,	4,872,	4,109,	8,363,
United States	292,073,	32,690,	238,006,	26,170,	138,616,	34,170,
Peru	4,683,	1,080,	3,323,	591,	2,945,	1,061,
Chile	12,409,	4,037,	9,612,	1,761,	5,349,	3,749,
Brazil	9,035,	6,717,	8,344,	5,146,	7,998,	6,265,
Argentine Republic	51,592,	13,953,	63,887,	11,506,	37,151,	14,597,
Other countries	62,313,	30,009,	53,520,	15,140,	36,817,	23,665,
Total—Foreign Countries	646,318,	320,397,	581,228,	236,285,	509,358,	258,633,
BRITISH POSSESSIONS.						
Channel Isles	2,496,	1,700,	2,032,	1,463,	2,272,	1,364,
Egypt	26,612,	11,235,	—	—	—	—
Nigerian Protectorate	7,437,	3,324,	6,034,	3,202,	4,742,	3,951,
Cape of Good Hope	7,782,	9,368,	7,190,	8,048,	7,549,	9,222,
British India (including Burmah)	72,341,	52,809,	62,341,	45,572,	43,414,	62,981,
Straits Settlements (including Malay States)	22,319,	6,039,	20,016,	4,293,	16,393,	5,702,
Ceylon	10,751,	2,734,	12,259,	1,947,	8,126,	2,848,
Australia	36,195,	35,899,	45,281,	28,912,	36,956,	33,631,
New Zealand	31,618,	12,078,	30,417,	9,380,	22,978,	9,422,
Canada	58,630,	18,008,	41,001,	13,303,	31,419,	17,264,
British West Indies (including Bahamas)	5,047	2,177,	4,121,	1,881,	2,402,	2,402,
Other Possessions	21,606,	30,778,	41,835,	30,363,	11,824,	22,881,
Total—British Possessions	302,834,	186,149,	272,528,	148,362,	188,075,	171,598,
Total — Foreign Countries and British Possessions	949,152,	506,546,	853,756,	384,647,	697,433,	430,231,

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* Including Faröe Islands. † Excluding Colonies. ‡ From 1915 Egypt is shown as a British Possession. § Excluding Hong Kong, Macão and Wei-hai-Wei. ‖ Including Formosa.

Trade of United Kingdom, for the Years 1911-1916.—*Declared Value of the Total Exports of* **Foreign** *and* **Colonial** *Produce and Manufactures from the United Kingdom to each Foreign Country and British Possession.*

Merchandise Exported to the following Foreign Countries, &c.	[000's omitted.]					
	1916.	1915.	1914.	1913.	1912.	1911.
	£	£	£	£	£	£
Russia	9,375,	11,472,	7,351,	9,589,	7,992,	8,806,
Sweden and Norway	3,703,	5,938,	2,016,	1,529,	1,439,	1,626,
Denmark*	2,824,	4,148,	1,364,	586,	621,	564,
Germany†	—	—	13,347,	19,878,	19,223,	18,075,
Holland†	8,932,	12,425,	7,309,	5,128,	5,095,	4,722,
Java	146,	132,	44,	46,	31,	37,
Belgium	16,	46,	4,973,	7,405,	7,361,	7.252,
France†	14,772,	12,604,	9,274,	11,920,	12,007,	11,159,
Portugal†	916,	830,	545,	662,	594,	584,
Spain†	1,663,	1,265,	766,	763,	790,	572,
Italy†	3,537,	3,690,	1,044,	1,014,	999,	1,383,
Austria-Hungary	—	—	761,	1,304,	1,219,	1,348,
Greece	61,	175,	66,	59,	35,	47,
Roumania	3,	8,	51,	71,	91,	79,
Turkey (European and Asiatic) and Crete	25,	52,	103,	250,	221,	265,
Egypt	—	—	177,	160,	153,	147,
Philippine Islands and Guam	26,	25,	54,	61,	45,	35,
China ‡	157,	79,	123,	168,	113,	126,
Japan §	468,	300,	206,	296,	240,	257,
United States	31,898,	29,375,	29,992,	30,239,	34,583,	28,560,
Peru	74,	55,	78,	105,	115,	100,
Chile	340,	229,	254,	357,	349,	333,
Brazil	395,	427,	338,	555,	511,	451,
Argentine Republic	650,	596,	504,	803,	774,	717,
Other countries	3,176,	2,794,	2,476,	3,129,	2,773,	2,386,
Total to Foreign Countries	83,157,	86,665,	83,216,	96,077,	97,374,	89,631,
British Possessions.						
Channel Islands	411,	342,	272,	251,	284,	241,
Nigerian Protectorates	300,	—	275,	219,	291,	262,
Cape of Good Hope	885,	852,	821,	957,	957,	872,
Brit. India (including Burmah)	1,578,	1,047,	950,	1,423,	2,148,	1,616,
Straits Settlements (including Malay States)	271,	158,	126,	214,	147,	124,
Ceylon	150,	113,	116,	131,	122,	103,
Australia	3,159,	2,902,	3,447,	3,370,	3,448,	3,655,
New Zealand	834,	754,	1,001,	943,	795,	739,
Canada	3,553,	2,743,	3,124,	3,511,	3,789,	3,007,
British West Indies (including Bahamas)	341,	406,	386,	394,	398,	459,
Other Possessions	2,969,	2,815,	1,756,	2,166,	2,085,	1,957,
Total to British Possessions	14,451,	12,132,	12,274,	13,579,	14,464,	13,089,
Total to British Possessions and Foreign Countries	97,608,	98,797,	95,490,	109,656,	111,838,	102,720,

* Including Faröe Islands, Iceland and Greenland. † Excluding Colonies.

‡ Excluding Hong Kong, Wei-hai-Wei and Macão. § Including Formosa.

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JOURNAL

OF THE ROYAL STATISTICAL SOCIETY.

MAY, 1917.

How to Improve Our Fishing Industries.

By the Right Hon. the Earl of Dunraven, K.P., C.M.G.

[Read before the Royal Statistical Society, March 20, 1917, Mr. Geoffrey Drage, M.A., Vice-President, in the Chair.]

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I.

Fish is a very valuable article of food, and none of our main sources of food supply has had such a curious history.

"Fish, flesh, fowl" is a remarkable phrase probably of remote antiquity. It is not due to mere love of alliteration. That could have been accomplished by other combinations. There is sense and meaning in the order in which these articles of food are placed. Anthropological research teaches us that the inclination of primitive man was to dwell near rivers, lakes, and on the sea shore. Primitive man lived on what he could gather and catch. He found he could pick up shell-fish in abundance and could capture fish easier than flesh, while fowl must have been practically beyond his reach, and the saying "fish, flesh, fowl" probably dates from a period when for the majority of human beings fish came first of all in their meat dietary.

No reason, except neglect, exists why fish, as an article of diet, should not be of the same value to modern and civilized man as it was to ancient and uncivilized man. Yet no other item of our Food Supply has been so little altered in so far as the methods of handling it are concerned. Remove the difference between sail and steam (and the fishing fleets of the world have a lower proportion of steam to sail than any other form of maritime traffic) and there is little to choose between the methods of handling fish to-day and those employed by the Apostles.

The industry of fishing, unlike the grain trade and the meat trade, has attracted comparatively little capital, and has never been organized on a modern industrial basis. Unlike the grain trade and meat trade, too, it has benefited little by the operations of applied science.

If we still treated our meat as we are treating our fish, the vast majority of our poorer population would be living on salted and smoked meat, and a large amount of surplus and decaying beef and mutton would have to be destroyed or used wastefully as manure.

In no other section of our food supply, therefore, could the application of capital to a comparatively small amount mean so considerable a development, and in no other would the adoption of the scientific principles of preservation already used in the meat trade effect so marked a revolution.

Finally, the fisheries form an attractive field for enterprise because of the small amount of interference with invested interests involved, and because of the possibilities of increasing the revenue which the State may enjoy as a whole.

The subject of this Paper—fisheries, obviously opens the door to enquiry into a question fascinating in itself, and certain to become of vital importance in the future, and probably in the near future. I mean the question whether it is or is not to the advantage of individuals and of a community that states or governments should control the development of industries at present undeveloped, but capable of great expansion; and whether under State control or ownership, assets at present lying fallow can be realized for the purpose of liquidating debt. That is far too vast a matter for discussion now. Moreover, we are all I think more concerned with the concrete problem of food supply than with economic theories, and to fish as *food* I will confine myself; but I may perhaps be allowed at the outset of the enquiry to devote just a few minutes to the question of Revenue. At the present moment the largest contribution made by the consumer *quâ* consumer to State funds is made through the liquor trade. Restrictions placed upon this trade from other motives than those of revenue are already showing signs of affecting the yield from this source, and it cannot, I think, be doubted that we are on the threshold of a movement which is likely to increase in volume. The national consumption of liquor is bound whether quickly or slowly to decrease and with it the revenue which it provides. We are, therefore, liable to be faced with a situation in which (apart from any fiscal changes which I leave out of account for the moment) the consumer will give less for State purposes than he has done before and the total revenue will be thereby diminished.

We drink ourselves, it has been said, out of national debt. Would it not be in every sense better if we were to begin to eat ourselves out of it? How would it be if we were to make the consumer contribute in another way? If instead of taxing what he consumes and therefore tending to raise the prices he pays for it, we were as a State to trade in what he consumes and thereby retain for the commonwealth the profits which would otherwise be earned by the middleman, and might very possibly be earned by foreigners? To try and give an estimate of results in figures is futile, so limitless is the possibility of expansion in the fishing industry, but I am persuaded that with State control, State organization and State development we could not only meet the necessities of our people by supplying them with a most valuable article of food at an extremely cheap price, but could also earn for the Exchequer an annual yield which might surpass, and might easily very much surpass that derived from any liquor duty. The importance of this, now that we have to contemplate meeting the interest on a vastly increased debt, is too obvious to need further comment.

That is, however, a matter for the future. There are, at present, more immediate problems to face. The war has affected fisheries more markedly than perhaps any other source of food production. A few figures may be given to illustrate this point. Up to May, 1916 (beyond which no exact figures are available), 270 British fishing vessels have been either sunk or captured by the enemy, and 500 fishermen have lost their lives while fishing. Many more men and boats have suffered the same fate since that date. In the same period roughly ten times that number of boats have been commandeered by the Admiralty for patrolling, mine sweeping and anti-submarine services. The effect upon the industry is very marked. The total catch of fish, which was in round figures 15 million cwts. before the war had dropped in 1915 (which is the last year for which statistics are available) to 6 million cwts. Owing to the enormous rise in price, the value of the total catch dropped comparatively little; whereas the 15 million cwts. fetched 9¼ million pounds sterling, the price paid for the 6 million cwts. was 8 million pounds. No more convincing illustration could be given of the importance of the problem with which I am attempting to deal. Moreover, the cost of fishing vessels, plant, and carriers has increased enormously. For the ordinary steam trawler or drifter it is 72 per cent. greater than it was at the beginning of 1914, and for the larger ocean-going trawler at least 50 per cent. greater. These figures, large though they are, may yet be below the truth, for it is by no means certain that for some time after the war it will be possible for private persons to get fishing vessels at all. The number of vessels taken up by the Admiralty is, roughly speaking, 3,000—500 from Grimsby alone. Some of them have been lost and many will require a large expenditure to refit them for their original purpose. On the other hand it is true that the Admiralty have constructed a number of trawlers for their own use, which can probably be adapted for fishing after the war, but nevertheless if the industry is to recover it will need financial assistance to get new boats built, existing boats repaired and gear provided. It will also require financial assistance in the matter of insurance, since for some time after the war floating mines will endanger navigation.

The industry indeed has been so disorganized by the war that, if it is to be re-established in reasonable time, generous State assistance is required in the following directions:—

(1) In scientific fertilization and fish culture: if we reason from the operations conducted in the United States, a large development of our inshore fisheries (especially salmon, lobsters, oysters) can be secured at moderate cost.

(2) For the reorganization of the fishing fleet by (*a*) the return and refitting of fishing vessels taken over by the Admiralty and by the fitting out for fishing purposes of suitable vessels lately built by the Admiralty; (*b*) the construction of new trawlers and drifters, and relief to those heavily mortgaged.

(3) For the construction and maintenance of cold storage in all the principal landing ports and centres of population, and by control of railway rates. Cold storage and control of rates are most important, for the problem to a large extent resolves itself into the preservation of fish—a most perishable article of food—thereby obviating both periods of excess and periods of scarcity, and into securing cheap

and rapid transit. State assistance of the kind suggested obviously implies State control or State ownership. No insuperable difficulties stand in the way.

II.

In considering this vital question of food supply, we must not confine ourselves to endeavouring to deal with the present crisis. It is a fatal mistake to suppose that the day after peace is declared a vast stream of food products will flow into these islands. If the war is over at the earliest date the most sanguine among us can imagine we shall for many years be faced by a general food shortage all over the world. The 1916 harvest has been a comparative failure, and in certain wheat areas, notably Rumania, crops have been deliberately destroyed. Further the high prices in the United States of America prove that the shortage is world-wide and that consumption would seem temporarily to have out-run production. I mention the fact because in the propagation of salmon we have a very certain means of increasing the home supply of food. It must be undertaken, though no practical effect upon home production can be expected for four or five years.

In these days when salmo salar sells for about 3*s.* a pound, it would be amusing, if it were not rather tragic, to recall the fact that a generation or two since it was often provided in the engagements with domestic servants, that they were not to be fed with salmon more than once a week. In my early days salmon was, in all districts to which it found access, a very cheap fish, fetching about 3*d.* or 4*d.* a pound. If we are ever again to see salmon on our slabs at any such price, only vigorous and sustained State action can secure it.

Fish are curious creatures. Some, like salmon, live and grow fat in the sea, and seek the rivers to spawn. Others, like eels, live and grow fat in the rivers and seek the sea to spawn. The origin of these vagaries is beyond the wit of man to discover.

I have not alluded to lobsters and oysters. No reason exists why shell-fish and crustacea should not be brought within the reach of the poor, but I am dealing with fish proper, and I confine myself to salmon because the salmon is by all odds the most important of our anadromous fishes—the fishes which ascend our rivers to spawn. For the very reason that the salmon does ascend rivers to spawn, that fish lends itself to scientific propagation far more readily than do the fishes which are born and live in the ocean. The salmon is, at the critical time, under close observation, the sea spawning fish are not.

It is desirable to go at some little length into the biology of this important fish. Salmon derive their entire food from the ocean, and as the ovaries begin to fill, Nature sends them up our rivers, the digestive organs are then functionless, and for perhaps six months the salmon is a "total abstainer." That is, I believe, scientifically proved, and must be accepted, though it is difficult to see what object a salmon has in taking minnows and worms in fresh water. Anyhow that does not matter; the main point is that this welcome and sporting visitor brings as it were to our very garden gates, a hundred miles inland, the choicest tribute from his rich ocean pasture. How does he produce his species? A hen salmon, of, say, twenty pounds, deposits some twenty thousand eggs, her male attendant fertilizing these eggs at haphazard. The eggs—probably not one in ten impregnated at all—settle down amongst the fine gravel of the river, and if fertilized, hatch out in due season. Anyone who has watched this operation of spawning, which is however chiefly carried on at night, will have observed eels standing on their heads boring into the gravel and a number of trout in close attendance; these trout are engaged in swallowing every possible egg that the stream washes down their way. It seems a wasteful enough operation and that here we catch Nature at fault; but who can tell? We must remember that these very trout some thirty days earlier, say in early November, have themselves been submitted to this spawning ordeal; that they too have spawned away perhaps a fourth of their gross weight, and being voraciously hungry are building up their substance and internals on the food which is despatched to them as also to us from the ocean, many hundreds of miles, in the vitals of salmo salar. That, however, is quite another story; what I want to point out is, that if we resort to scientific fish culture we can probably so immensely increase the salmon yield of our rivers, that we may again hope to see salmon at 4*d*. a pound. I need not elucidate the process of "stripping" salmon of their eggs. It is very easily done, and without injury to the fish. It is enough now to say, that of the eggs obtained in this way, and thus protected from innumerable enemies in hatching troughs, at least 95 per cent. come to the hatching stage, instead of, as in the case of wild spawning, some 5 per cent. at most.

I desire to make this point quite clear, in view of our food requirements. Not only is Nature's method of spawning wasteful, but the fish themselves, spawning in the head waters of our rivers, in shallow and unprotected tributaries, must always be very difficult to protect from poachers, for the riparian proprietors have no interest whatever in the protection of these salmon, seeing that the fish do not appear on the spawning beds until the close season, when they are unfit for food. Any estimate of the salmon our rivers might carry, given scientific and generous propagation by the State, must be largely conjectural. But in, for instance, the case of the Rhine, and of the Penobscot River in Maine—two rivers where Government hatcheries on a large scale have been in operation for many years—the evidence points to some 5 per thousand of the fry hatched and liberated returning the fourth and fifth year after as marketable salmon. Now a rough stock-taking by the late Duke of Richmond's Commissioner of the number of fish spawning in the Spey was attempted some years ago and the enumeration for that noble river was about 6,000 pairs of fish. Giving an average product of 15,000 ova per fish we have then for that single river perhaps 90 million eggs. Were it possible that all this mass of ova could be fertilized and then passed into hatcheries, and if 5 per thousand of the fry returned as salmon the fifth year after, then the return to the Spey alone would be nearly half a million salmon, a far greater number than are taken yearly in all our British and Irish rivers. It is true that 90 million eggs would require a considerable establishment on the Spey; but the various Federal and State hatcheries in the United States provide for not less than 1,000 million eggs. In Canada the 56 Government hatcheries release yearly 100 million salmon and trout, 493 million whitefish, and 900 million lobsters. To show what can be done, not only in propagation but also in plantation, I may mention that in 1886 two species of fish unknown in the Pacific, namely, the shad and the striped bass, were "planted" by the Federal Government off San Francisco. And in the Report for 1896, only ten years later, the Commissioner of Fisheries states:—

"The market value to the fishermen of the Pacific Coast of the "shad and striped bass taken between 1888 and 1896 was about "$192,000. The aggregate expense of introducing these fish to the "Pacific Coast was under $5,000."

And we are told in one of the recent Reports that the shad now ascend these Pacific Coast rivers to spawn along a littoral of nearly 3,000 miles. What a marvellous return for a very small capital expenditure! To show how utterly negligent we have been it is sufficient to say that for every pound we in this densely populated and sea-girt country have spent on fisheries Canada has spent five pounds, and the United States have spent twenty-six pounds, and it has paid them well.

The biology of the salmon, our greatly increased knowledge of this fish, the scale reading by which Doctor Calderwood has been enabled to tell us the history and almost the wanderings of salmo salar—this is all new and most important, but it must not divert our attention over-much from the real subject matter of this paper. A few words, however, I should add as to the alleged failure of hatcheries in these islands. It may be argued that the propagation of salmon can be undertaken by private individuals. That is a mistake. There may be cases where one individual owns or controls a river from the estuary to the spawning beds ; but if such cases exist, they are certainly very rare. As a rule salmo salar in his ascent and descent of a river passes through waters used by men only concerned with taking him by means of fixed and movable engines, owned by men interested in him for sport, or owned by men in the upper waters who take little interest in him, except to hook him out with a gaff, or the spawning beds where he is of little use except to feed pigs. The interests are too divergent and too conflicting to be reconciled by individuals or associations of individuals. The industry can be developed only by the State. Moreover, salmon need adequate protection in the broad estuaries and in the open seas and that also can be afforded only by the State. It might be well also for the State to consider whether the protection of predatory birds is advisable. Cormorants and other gormandizers exact a heavy toll upon the small fry and smolts in our rivers and tideways.

III.

I have dealt with the question of fish culture first, because it is from it that we must expect the greatest ultimate increase in our own fish supply.

In the nature of things, however, it must necessarily be some years before we can achieve any considerable increase by this means in the fish supply available. Our needs are more immediate. We have got to consider what measures are available here and now for extending our supply of fish, for lessening its cost, and for making it readily available for the population all over the country. As I have already shown, the war has had a serious effect on the fishing industry. This has, however, not been without its brighter side, and though losses in trawlers have been exceptionally heavy, the last two years work has been very profitable for owners and fishermen ; partly of course this is due to the high prices, but it is also accounted for by other reasons. It is probable that fish is more abundant in the seas surrounding the British Isles than it has been for years. It is true that quantities of fish have been destroyed by explosives, but on the other hand in many areas three seasons have come and gone without interference from the trawlers, and millions of fish have matured that in other seasons have been caught immature; and these matured fish have spawned. In the areas restricted by the Admiralty there is every prospect of a great quantity of fish being found when peace comes. We are, therefore, justified in assuming that if we can provide measures to overcome the difficulties which at present impede the full utilization of the existing fish supply ashore and afloat we can very considerably ameliorate the whole food situation.

So far as the present situation is concerned our efforts must be directed to the better organization of the fish supply when it reaches the shore; that is to say, to the provision of better internal transport arrangements, and of cold storage, to which I shall return later on in this Paper. After the war, however, we must direct ourselves to increasing the productivity of the fishing areas themselves. In this matter the Admiralty must play a leading part. It will be their duty to release, as soon as national safety permits, the 3,000 or so fishing trawlers and drifters in the Naval Reserve, which they took over at the beginning of the war. It will also be their duty to adapt for fishing purposes as many as possible of those trawlers which they have themselves built for the purpose of mine-sweeping and anti-submarine work. Provided these two measures are carried out in a sufficiently wholesale manner, there is every reason to hope that in spite of the heavy losses which our trawling and drifting fleets have suffered, both while fishing and while on Admiralty work, the number of fishing vessels available after peace conditions are restored will be actually greater than those on the register in 1914.

Moreover, there is no reason why the Admiralty should not combine its own particular business with the fishing industry. After the war a certain number of trawlers and drifters, a flotilla perhaps of over a thousand boats, will be retained by the Admiralty as mine-sweepers, patrols and carriers, and also for training men and boys for the Service. The crews would probably be drawn from the fishing population. In any case even if they were drawn from the general body of naval recruits, they would be trained to handle nets, and they might be most advantageously employed in fishing for a considerable part of the year instead of, as has been customary, spending long spells in harbour. Such a fleet of boats, if put into commission, equipped with fishing gear, and manned by, at any rate, a proportion of Naval Reserve men and experienced fishermen, would earn a very large income for the State, or, if considered desirable, would keep the Army, the Navy and all Government Institutions supplied with fish. It would also have the great advantage of training young sailors from inland places in the art of fishing, and therefore, providing ultimate recruits for the fishing industry from the Fleet Reserve.

But if the good-will of the Admiralty is necessary for the re-establishment of the normal fishing conditions at the earliest possible date after the war, the practical assistance of the State is necessary in order that these conditions may be exploited as fully as possible for the public benefit. The system of State loans for fisheries hardly exists at all in England, and in Ireland only to a trifling degree. In Scotland it has had many warm supporters, but the departmental committee which reported only a fortnight before the war, decided against it, apparently partly on the evidence of witnesses who were themselves engaged in the present system which finances the owners of Scotch steam-drifters and sailing-boats—a system which can hardly be defended from an economic point of view. The English experiment, for it was only on the report of the Harmsworth Committee of enquiry in 1913 that the Government decided to try the experiment of small loans to Cornish fishermen, has been a brilliant success. Villages where emigration was the only hope for the active, and poverty and decay the lot of everyone else, have become prosperous again by this trifling application of 4,000*l.* a year to the purpose of installing gasolene motors into fishing boats. So successful has been the experiment that its extension is contemplated to neighbouring counties. It ought to be the first purpose of the authorities responsible for dealing with fisheries to extend it throughout the United Kingdom. Where no system of financial accommodation already exists such a system of loans at a very moderate cost to the State will help the fisherman who fishes near the shore, to install apparatus which will render him largely independent of wind and weather, and will therefore enable him to multiply by many times his output. Where financial assistance already exists accompanied too often by such undesirable features as the tied-boat system and by an often exorbitant rate of interest, State assistance would place the fishing industry on a sound financial basis, yielding a fair rate of interest to the State and providing a sinking fund for the ultimate liquidation of the loan. By increasing the numbers of boats at work it would greatly increase the available food supply.

IV.

In the matter of transport and cold storage it is possible to effect a good deal now, and it must be done. It is indeed especially in this matter of transport and distribution that the active interest of the State is least open to question, and for the present, at any rate, it is upon this that the Government ought to concentrate.

Even with the present restricted fishing areas a large leakage takes place between the producer and the consumer, and it is a leakage rather of bad economy than of any reprehensible conduct on the part of agents or dealers. It is, in fact, a necessary sequence of an inefficient organization and it can be effectively stopped only by the action of the State itself. I have the word of an expert on this matter that it is not too much to say, so far as the in-shore fisheries of Great Britain are concerned, that efficient organization for landing, transport and distribution could, on a pre-war basis, be made to bring about the following results. It could greatly increase the yield. It could halve the price to the consumer, it could double the return to the producer, and yet leave a handsome profit to the distributer. There is no reason, whatever, on this basis why fish should not become a staple food for the working class population.

Both as regards railway and cold storage facilities the fish trade is in its infancy here. The railway companies running to the fishing ports had, before the war, a system of refrigerating vans which travelled by passenger train, and by means of which the supply to Billingsgate was very largely kept up. This system has, of course, suffered as a result of the pressure on railway traffic, due to the war, but at best it never approached in magnitude of efficiency to the similar enterprise conducted under the direction of the Fisheries Branch of the Canadian Naval Service which is described in the Forty-ninth Annual Report of that Branch. Cold storage facilities on a large scale exist in this country for the purposes of storing meat. They should be extended by State enterprise until every centre of population of 20,000 inhabitants or over, has convenient refrigerating accommodation. It ought to be possible now, in view of the heavy decrease in the import of meat from South America and elsewhere, to utilize vacant cold storage for the purpose of fish.

It will, however, be found that the question of cold storage assumes its greatest importance in relation to the possibility of fish supply from across the Atlantic.

On the vast nearly untapped fishing grounds on both Canadian coasts, war conditions have had little effect, and on these we can look with confidence as sources of additional supply.

The seas breaking upon the rocky, indented shores of Newfoundland and the Labrador and the waters that wash the Eastern coast line of Canada afford a prolific feeding ground for commercial fish; and this fecundity is even more pronounced on the Pacific coast of Canada, where fish are not only extraordinarily plentiful but are also peculiarly accessible. The rivers swarm with salmon, and in the numerous deep and sheltered bays and fjords halibut and white fish of all kinds are found in great abundance. The waters of the Pacific coast really teem with a wealth thus far scarcely touched.

It is no exaggeration to say that in the seas that wash the coast of Canada the principal commercial food fishes are to be found in greater abundance than in any other part of the world. Properly conveyed to this country in fast cargo-boats equipped with refrigerating plant, the fish supply of Canada could be put on the English market, leaving a profit for all concerned, at a very low price.

During the present existing critical period Newfoundland naturally attracts special attention on account of proximity. The cod is the principal product. The industry is conducted on somewhat primitive lines, and production could easily be quadrupled. The cod is peculiarly adapted to meet human needs. As food it does not cloy the appetite and tire the palate as quickly, at any rate, as do other species of fish; and cod-liver oil is very valuable though very nasty. The Newfoundland trade is export, largely to South America—Brazil being the principal importer. Practically we do not import any salt cod from Newfoundland. Why should not the stock of cured fish be diverted to our markets? Cod can be taken nearly all the year round. Newfoundland is only about four days distant from us. Why are no steps taken by us to supply ourselves with fresh or chilled codfish—a wholesome and palatable food?

V.

A short Paper such as this, cannot hope to be exhaustive, but I cannot close it without some reference to subsidiary problems. Among these, the whaling industry must take chief place. Since the discovery, ten years ago, of the process known as "hydrogenation," of fats, by which the smell and taste of whale oil is entirely removed, and a finished product left, which is hard and white, like suet fat, and can be used for similar purposes, the whaling industry has very greatly increased in value and importance. No part of the fishing industry lends itself more readily to the kind of national policy which I have merely sketched out in this paper. In whaling, there are no vested interests, so far as production is concerned. The industry is carried out by various companies, under licence from the British Government, and since the commencement of war the annual licences have been endorsed to the effect that whale oil products must be brought to the United Kingdom. Moreover, all whaling stations in Southern waters (now the most prolific area), are without exception on British territory. The fact of the certain continuance of high prices of beef and mutton tallow, and the various uses to which it can be put, will guarantee a high level of price over a very long period, and I am assured on expert authority, that we are not stepping beyond reasonable estimates when we say, that well managed under State control, this industry will yield a million pounds a year income, after allowing for generous treatment, so far as the men engaged in the business are concerned.

Other subsidiary industries concern us less. Save in the case of a serious dearth of chemical manures, the use of edible fish for this purpose can never be economically justifiable, and the practice, too common in some coastal areas, should be steadily discountenanced while present food conditions rule. The manufacture of concentrated fish manures from fish offal, however, which is already a profitable, though still a small industry, must naturally increase as the raw material for it is available in larger quantities. As this kind of manure is particularly valuable for intensive horticulture after the French plan, it is perhaps not too fanciful to say that by increasing our fish supply we shall contribute to the cheapening of food all round. Canning is at present a small industry with us. The requirements of the Ministry of Munitions make it entirely impossible, even were it desirable, to extend it till after the war. I cannot, however, believe that when the tin supply is again plentiful, English manufacturers will be content to leave in the hands of the United States and of Norway pre-eminence in such a lucrative article of commerce.

To sum up: The Government have taken over factories, coal mines, railways, canals, breweries; they settle the wholesale prices of the products of the earth; and they can exercise compulsion to increase the land area under cultivation. Why is the sea neglected? Why not draw upon the sea to meet our present necessities? Without doubt, food can be derived from the sea quicker and cheaper than it can be extracted from the land. No compulsion is required. In order to bring about immediate results, the State can act in three directions. In a very short time the main herring fishing will commence. Large quantities of herring will be taken in Scotland and in the north of England. As a rule the fish salted are exported. Export must be prohibited and the fish should be brought fresh as far as is possible, or slightly cured, to the large centres of population. The same may be said of mackerel. In pre-war times mackerel scarcely paid. Large quantities used to be taken off the coasts of Ireland and exported to the United States. That business was killed by import duties; but the fish are there. Catches are made all round our shores far too large for local consumption. The mackerel is a perishable fish; but all that is wanted to bring it to the people is method and rapidity of distribution.

In considerable areas, in many deep bays along our coasts trawling is prohibited. That is I daresay a very wise provision; but in view of an emergency the prohibition should be relaxed. To my certain knowledge deep and sheltered bays in the west coast of Ireland, teem with fish—skate, ling, congers, dog fish, coarse fish—especially the latter, but edible and wholesome food. Trawlers and long liners should be permitted and encouraged to fish those waters.

Transportation—cheap and rapid—must be provided by the State. Fish trains should have precedence over all traffic except military trains, and rates should be very low even to the extent of entailing considerable loss. All existing cold storage plant should be taken over and utilized to the best advantage; such of it as is lying idle being used for fish, and additional refrigerating plant should be set up at once. In short a minister or a Department should be created whose sole business it is to grant loans to fishermen, to provide means for preserving fish, to ascertain when and where fish are available and in what quantities, and to provide for the rapid transportation to the consumer of the fish fresh, and subject to Admiralty control to throw open prohibited areas to our fishing fleet.

DISCUSSION ON THE RIGHT HON. THE EARL OF DUNRAVEN'S PAPER.

THE AUTHOR after reading the paper added that a Committee with executive power and sufficient power to act, and act promptly, was needed. If that were done, as he hoped it would be, in his opinion, the fish would help them to get rid of that anxiety which they all felt now as to supplying the people of this country with an adequate quantity of food. If it were done it would be the beginning of something which he believed would expand in the future into such a development of the resources of the Empire as regarded fish, that it would be a great financial and economic advantage to the Empire, and as far as the supply of food was concerned, to the whole of the world.

The CHAIRMAN expressed the very great regret of the President, Sir Bernard Mallet, at his absence.

Sir JAMES WILSON, K.C.S.I., in proposing a vote of thanks, said that Lord Dunraven in his valuable and interesting paper, had directed their attention, and he hoped that of a larger outside audience, to what was at present, and would be in the future, an important question for the welfare of this country. He did not pretend to be an expert on fisheries, and he would not detain them long, because they could get more valuable remarks from the experts who were present than from him. Nearly all his working life he had been in India, nearly a thousand miles away from the sea, up in the Punjab, where they did not see much of sea fish ; and though the rivers produced a large quantity of fish, it was surprising how little the population used them. Something had been done to encourage the use of fish by the people as an article of food,. and he was glad to see that the authorities were still taking measures in that direction. In this country he had been a Superintending Inspector under the Board of Agriculture and Fisheries to encourage the starting of co-operative societies among small holders on the land for credit and insurance. The Devon and Cornwall Fisheries Committees having asked for Government help for the inshore fishermen, he was sent down there in 1912 by the Board to make a preliminary report upon the subject. He was accompanied by Mr. Fremantle, son of Admiral Fremantle, a civilian like himself, who had done a great deal in India towards the development of the co-operative movement which had been so extraordinarily successful amongst the Indian peasants. They went round a number of fishing villages on the coasts of Devon and Cornwall, and talked to the fishermen and others interested in the business, and enquired into, among other things, their insurance societies, of which there were two or three very successful ones managed by the fishermen themselves on co-operative principles for the insurance of their fishing boats. They enquired into the facilities for getting credit and what the fishermen were doing with the money they could get, and found that in some of the villages they were putting motor engines into their fishing boats, thereby increasing, as Lord Dunraven had told them, their catch of fish and the rapidity with which they could bring it to the market—a very important matter in the case of fish, which so soon deteriorated. Mr. Fremantle and he had made a report on the result of their investigations, and had strongly recommended that the Government should do what it could to encourage the establishment of co-operative credit and insurance societies among the fishermen of Devon and Cornwall. In giving his general ideas as to what the Government should do to help these fishermen, he had said : "When I first went to India many years "ago the then generation of officials had been brought up in the "doctrines of Adam Smith, Ricardo, and John Stuart Mill, and "interpreted them, perhaps wrongly, as teaching that the duty of "the State was to establish a system of law and of administration "which would treat men with perfect equality and to carry it out "remorselessly, satisfied if it was just to the average man, and "leaving the weakest to go to the wall." That was the phrase used in India when he first went out there. He was thankful to say that a different spirit now prevailed in India. It was recognized that all men were not equal—that often the forces which inspire human action, like the forces of nature, might be crushing to the individual, however bravely he contended against them, and it was the duty of the State, as representing the whole of the community of kindly-disposed persons, to come to the rescue of distressed classes and individuals, so far as that could safely be done without running the risk of demoralizing them and weakening their moral fibre. They found in India it was less demoralizing for the State to help those who were striving to help themselves, and above all to show that it sympathized with them in their distress, than to stand idly by with folded hands and compressed lips and let them go down vainly struggling with the forces arrayed against them. He had then gone on to say: "And these fishermen in Devon and Cornwall " are an exceptionally brave and frugal class. It is no fault of theirs " if their industry no longer affords them a sufficient livelihood. In " their case there is the further argument in favour of State help, " that the country requires the maintenance of as many as possible " of this class of men in the interests of the Navy. The fishing " population of those south-western coasts, has lately been decreasing, " men are taking to other occupations and many of them are migrating, " to the colonies or elsewhere. It may in many cases be better for " them as individuals that they should do so, but the country loses " their skilled services in the Navy, and it is worth the country's " while to spend a little money in order to keep up their numbers." That was written before the war; and now one might speak much more strongly, as Lord Dunraven had done, in the same vein. They all knew how extremely valuable the fishermen all round the coasts had proved to the country in time of stress, and it was hardly too much to say that if they had not had those men available and they had not so bravely come forward to risk their lives in all the dangerous operations which they had performed so well, the country would have been in a much more serious state than it was now. The prices not only of fish but of all kinds of food would have been much higher, and they would not have been so secure as they were at present. The war had been a great education to them all, and he, like many of them, had advanced in his opinions. He had been brought up on the old principle that the State should leave people to do as much as they could themselves, with as little control and interference from the State as possible. He at all events had altered his mind, having seen how much the State had had to interfere with the ordinary operations of the laws of supply and demand, and how much its control and its financial engagements had had to be extended. Although they all hoped that they would get back to a more normal state of things when the war came to an end, he thought most of them were prepared to see the State do a great deal more than it had done. He was not quite sure that he would go as far as Lord Dunraven seemed to be prepared to go in the matter of advocating State control of all the various branches of the fishing industry, and of such a large investment of State capital as he seemed to contemplate. Still he did think the State should do far more in that direction than it did before the war. He hoped he was not speaking treason; but he quite agreed with the last proposal of Lord Dunraven, that the fishing industry in this country was an important enough matter to require a separate department with a separate head of its own. Hitherto it had been one of the charges of the Board of Agriculture and Fisheries. These two industries had a certain connection with each other, because they were both engaged in producing food, and were also similar in so far as both the farmer and the fisherman, and especially the small holder on the land and the small fisherman on the sea, found it difficult to combine and to have their interests pressed upon the nation. The concentrated populations of the towns were well represented in the House of Commons and elsewhere, and could easily combine to form societies and to look after their class interests, whilst the small farmer and fisherman, from the nature of their occupation, and the scattered way in which they lived, could not combine so readily to help each other. Agriculture, of course, was a much more important matter as regarded the number of people engaged in it than fisheries were, and he thought that the combination of the two industries under one Board had resulted, as Lord Dunraven had suggested, in the interests of fisheries being comparatively neglected even by those who were nominally in official charge of them. He himself would like to see a separate Fisheries Department established, with a strong man at its head, not a political party chief who went out and in with the Government, but a business man, appointed for five or seven years, and not removable merely at the will of the Cabinet. Another suggestion he made was that, if possible, all the fishery interests of the whole of the United Kingdom should be placed under one Fisheries Department. It was quite true that the conditions affecting the land were somewhat different in the different countries; but as regards fisheries the greatest interest of the British Islands was in the deep-sea fisheries, which formed one problem for the whole kingdom. If it were not too late in the day to make the suggestion, he would like to see one great Fishery Board entrusted with the control of all kinds of fisheries, both on land and sea. In conclusion, he had the greatest pleasure in proposing a vote of thanks to Lord Dunraven for his very valuable and interesting paper.

Mr. A. E. LARK, in seconding the vote of thanks, said he was not there as an expert, but coming from Great Yarmouth, the premier port of fishing, he might perhaps be permitted to express some of the views they had in Great Yarmouth on the very important subject to them of the Paper. The suggestion Lord Dunraven had made about a separate Ministry of Fisheries, was one which had been discussed at recent meetings held locally of the National Herring Fisheries Protection Association, and it was felt that that course was very important indeed in the interests of the herring industry, and he hoped they would hear more of that at no distant date. The question of State control was a difficult subject. They were of the opinion that the most was obtained from the sea under the present system of working the boats. The method was for the crews to have a large share of the proceeds of the catch, the owner of the boat sharing and also the owners of the nets. By that means the profits of the boats were distributed and everyone was a partner. It was thought that the best was done, as the incentive to all engaged was considerable, it being a co-partnership business from beginning to end. Doubtless great things could be done for the industry in the way of loans, because the cost of boats after the war would be almost prohibitive for small people. The question of transport again was a highly important subject, as the present facilities were insufficient, and this must receive serious attention. It was so important from a food point of view that when herrings were cheap it should be known promptly and they should be transported quickly into the centres requiring them. The question of foreign markets was a very great and difficult one; it was an intricate matter to discover the best ports to which to dispatch the fish with the most remunerative prospects. The herring catch was exported probably to the extent of 90 per cent., only 10 per cent. remaining at home for consumption. In all these directions the State through a Minister, who would specialize on the subject, could render immense assistance and greatly improve the industry. The Admiralty last autumn had thought proper to make a drastic prohibition in the number of boats fishing out of the ports of Yarmouth and Lowestoft, and only 70 boats were engaged, whereas 200 boats were available. They were most anxious that the Admiralty should, before the fishing commenced next autumn, confer with practical local people and with the Board of Agriculture and Fisheries, so that the best line was drawn. No one wished for a moment that any boat should go to sea to the detriment of the operations of the Navy, but they considered that so many more boats might have fished, and with the important question of food supply, it was highly desirable that the greatest number of boats possible should be allowed to fish. They hoped that this subject would be very carefully thought out in good time prior to next season, so that immediately the fish were available, the fishing operations might be commenced. He assured Lord Dunraven that his interest in the fishing industry was immensely appreciated. They knew of his practical interest in the industry, and his paper would be read locally with great interest, and he thanked Lord Dunraven heartily for the time and trouble he must have taken in preparing this most useful paper.

Mr. Moreton Frewen said he was very glad the proposal for State financing of our fisheries had come from none other than Lord Dunraven. He recalled twenty-five years ago a small committee which used to meet in Ireland and discuss the possibilities of the entire transfer of the land of Ireland to the tenants. It was the largest scheme of State Socialism that, he supposed, was ever proposed. The proposer of that scheme was Lord Dunraven ; and notwithstanding the opposition of his class in Ireland, the landed gentry, Lord

Dunraven's attitude and energy had happily coincided with the views of the late Mr. George Wyndham, and had persuaded the State to embark on that vast experiment which by the time the whole affair was completed, would involve an expenditure of some 200 millions sterling of State money. He wished Lord Dunraven God-speed in his new departure. Having exhausted the possibilities of land socialism in Ireland, he now proposed to carry their attention to what, to his mind, was an infinitely larger and even more promising scheme of State Socialism as applied to the ocean. Just as, in spite of the enormous difficulties and a great deal of ridicule in the earlier stages, the Irish Land Act had fructified, so he was convinced that those present at the reading of this paper were at the cradle stages of some very interesting history. Anything like the sums that were required for land purchase, were not required for this matter. The amount of support the State would be asked to give financially would not be very considerable. Lord Dunraven had pointed out in his paper that the present investment of capital in all their fisheries, was only a sum of ten millions sterling, and the gross yield of that ten millions sterling was over 10,000,000*l.* a year. When it was thought desirable in order to deal with only about 8,000,000*l.* a year of rental land values in Ireland, to secure a sum of 200,000,000*l.* surely now they were dealing with a great domain in nature, which yields a gross return of 10,000,000*l.* on a small sum like 10,000,000*l.*, there exists an opportunity for State assistance and a State partnership which he thought no other domain of nature provided. To his mind, the possibilities of the fisheries as revenue producers in the hands of the State, were not less than stupendous. He referred to the earlier works on the matter in connection with fisheries and fishery returns, namely, the Report of the Canadian Fisheries Committee in 1885. In 1885 the capital employed in Canada in all the fisheries was only 1,200,000*l.*, whereas the value of the catch was three-and-a-half millions sterling, and was declared in the report to cover but a four months' season. The fishermen on the Eastern coast of Canada were apparently only at work four months, and yet their wealth product was three-and-a-half millions a year; and the *per capita* product for the four months' season of the people employed, was at the rate of 24*l.* Ten years later, when in Australia, he had learned the return from agriculture in New South Wales, and compared the yield from the land there with the yield from the sea in Canada. It was at the rate of 21*l.* only for the population employed, and this for a period of twelve months. The returns from the ocean were incomparably greater than the returns from the land, or indeed from any other source of primary industry. The late Sir John Lawes, in a letter to *The Times* some thirty-five years ago, had pointed out that the yield of a surface acre of water off the Nore, was equal to the yield of 100 acres of the best Northamptonshire grass land; and that condition of things, emphasizing the great food value of the ocean, had been recognized by many other countries, but never by this. As Lord Dunraven had pointed out, they were a group of sea-girt islands, with the sea very near every man's door and the ocean rent free. But hitherto any idea of the intensive cultivation of that ocean had never appealed at all to our statesmen, and that was why he thought the paper they had heard really promised a new financial departure. He believed they could do much to earn increased revenues if they only got their fisheries properly handled at the hands of the State. Very appositely in the Weekly Official Circular of the High Commissioner of Canada of March 16, he had found this entry: "Fishermen engaged in the halibut fisheries of Prince "Rupert, British Columbia, working under a share agreement "instead of a wage schedule, are having a successful season. One "boat brought in 19,000 lbs. of halibut, which sold for 4,000 dollars, "each of the four men forming the crew receiving 30 dollars .70. "per day for fifteen days' work." Those four men, then, for only fifteen days' work got very nearly 100*l.* apiece. On the Pacific coast, where timber is so cheap, that amount would enable the fishermen to build an admirable four-roomed house, the cost of which would be well within the 100*l.* They would remember the old statement that at her zenith Holland was built up on the herring. He believed if the fisheries of the Empire were fairly fostered, the growth of the Empire would be incalculably advanced. He drew the attention of the meeting to the position of the fisheries in America, because these figures with regard to Prince Rupert halibut were there also not less suggestive. They may indeed throw a great deal of light on the growth of cities like Seattle which, in 1882, had a population of about 6,000, and now had a population of over 300,000, and of Vancouver, which in 1882 had no existence at all. He referred to the conditions of finance built up on the fisheries which, in his opinion, had enabled those towns to grow up with such phenomenal rapidity. With the comparatively low cost of living, not only fish but flour and meat being cheap, and the high rates of wages, the growth of those terminal towns was inevitable. The saving by the fisherman, which saving enabled him to invest in a lot in the town, and grow up with that town, had made for the advancement both of the citizen and the city. The Pacific coast was richer than any other coast in fish and food for fish. Nature worked on very generous lines, not as to fisheries only but forest and minerals. Sometimes they were asked whether there was a danger of those Pacific fisheries being fished out—could we always rely on a harvest so vast as now? Professor Elliot, during the controversy which the United States had with Canada over pelagic sealing, was asked to make a census of the seals on the Pribyloff Islands with a view of reporting what the fish consumption by seals was. The professor reported to the United States Senate that their fish consumption was probably at the rate of six million tons a year. When they considered that the consumption of fish in the British Islands at the present time was certainly not more than 10 per cent. of that, or 600,000 tons a year, it gave them an idea of the enormous food supply which nature had in store for them if they were careful to maintain the proper balance by keeping down predatory life such as seals and birds. The Governments of other countries had been more careful of their fisheries, the result being that in all cases the national interest had been much subserved. In Germany there was not even a piece of fresh water but was carefully stocked with the fish it would carry. He instanced the case of Prince Schwartzenburg, in Bohemia, who spend a quarter of a million florins a year on food for his carp ponds. In Germany agriculture and fish culture were often carefully intertwined. This prince dries his ponds each fourth year, the residual manure in the ponds being, of course, extremely rich, the ponds when dry being used to grow vegetables. In the fifth year the ponds were again filled with carp. In Chicago this "leather carp," *carpio cyprinus*, is sold in great numbers and at a better price than cod. Lord Dunraven had drawn attention to what might be done by salmon hatcheries in the hands of the Government on a very large scale. It was impossible to have travelled abroad, particularly in the United States and Canada, without recognizing the force of that statement. They were paying to-day 3*s*. a lb. for salmon, whereas in the New England States, salmon was 6*d*. a lb., and on the Pacific 2*d*. The Atlantic salmon between 1820 and 1840 had been fished out and exterminated, and then in 1864 had been re-introduced into the rivers of New England by the Federal Department of Fisheries, buying salmon eggs from the Canadian Government at a cost of 9*l*. per thousand eggs. When they considered that a ten-pound hen fish carried ten thousand eggs, they would appreciate the cost of reintroducing this valuable species. He himself had seen at the great Federal Fish Hatchery on the Penobscot River, in Maine, 400 large hen fish bought from the net fishermen for 12*s*. apiece for the purposes of that hatching station. It was preposterous that individuals here should be so bound up with Manchester School dogmas that they should allow the oceans at their doors to be almost utterly neglected by the State. Who is to cultivate the ocean, or even their rivers, if not the State? It was for the State to enter into these operations which were concerned with a domain of nature so vast and so important. That was why he recognized that the war had shaken them all up out of a rut of helpless indifference. He hoped that public opinion would develop in the direction of State management, and, if it did, he was clear that with that food problem now so threatening they would find the ocean one of the largest sources of a cheap and wholesome food supply.

Alderman HENRY POTTER said that the construction of the paper was such that they were discussing two separate questions as one and the same. The opener had suggested the possibility of raising an amount something like what they received from the liquor control, namely, 60,000,000*l*. a year income, from the fishing industry if it were controlled by the State, though he was careful to point out that the whole of the sea fisheries of the country produced only a net cash valuation of 10,000,000*l*. He could not help thinking it would be fallacious to consider that suggestion. They had two questions, the question of fish that came into their rivers, as to which the State might assist in the cultivation. But the largest question for the British fisherman was that of the cod, herring and other fish, and it could not be expected by anybody that the Government could control the cultivation of those fish or provide for anything like a State provision or receive a large revenue from them. He added that it was tolerably well recognized in the North Sea, and the other oceans patrolled by English fisherman, that they had already reached the limits of the cod and herring they could get. The British Government had no more control over the high seas than any other nation, and as far as the high seas fisheries were concerned, it was impossible to consider the State controlling their fishing boats.

The CHAIRMAN said he had intended to offer some observations on the paper, but as the hour was late and he was anxious that Lord Dunraven should have an opportunity of replying fully on the subject, he would not do so.

Lord DUNRAVEN replied. He said as it was getting so late he was not inclinded to avail himself of the invitation to reply by making a long speech. He had calculated that his paper, which he had had the honour to read to them, and to which they had listened with such exemplary patience, would take about twenty-five minutes to read ; but instead of that it had taken forty minutes. He intended it not to be in any degree didactic, but purely suggestive, and to lead to thought and some discussion. He was gratified to find it had led to most excellent speeches and most instructive discussion. He was thankful to them for the way in which they had accepted the vote of thanks, and also for the way in which it had been moved and seconded.

The undermentioned Candidate was elected a Fellow of the Society :—

Baron Alphonse Heyking, Consul-General for Russia.

TRADE WITH FRANCE BEFORE AND AFTER THE WAR.

By PROFESSOR PAUL MANTOUX.

[Read before the Royal Statistical Society, April 17, 1917,
the President, Sir BERNARD MALLET, K.C.B., in the Chair.]

THE causes that have fostered trade relations between France and England are many, and most of them permanent. Nature has made the two countries not only neighbours, but also different by the qualities of their soils, climates and populations. History has drawn them together not only in spite but because of their long political rivalry. The prolonged possession of Bordeaux and its vineyards by the Kings of England have made claret popular in this country, as burgundy has been in Flanders since Philip the Good and Charles the Bold reigned over Dijon and Brussels. On the other hand, commercial intercourse between the two countries was never suspected of being used by either of them as a means of invasion and conquest: just because their resources were in some way complementary to each other, it did not give occasion to the same fears, arising from competition, as their trade with other nations.

During the present war this happy faculty of helping each other has been illustrated by circumstances in which economic assistance has become closely associated with military support. This, and the consequences of the occupation by the enemy of the most important industrial districts of France, have created a highly exceptional situation, which should be the subject of a special study, because everything in it is abnormal. But, when industry and commerce have resumed their normal life, pre-war conditions can be only partially revived, although fundamental causes will remain. Those causes are but thinly hidden behind the veil of statistics. To realize what they have been and will be, we must do our best, not only to go beyond mere figures and reach the concrete facts, but we must also remember that man is not correctly defined an economic animal. Even his most matter of fact business transactions are conditioned by his needs and desires, his instincts, traditions and passions. I wish the figures I am going to quote could make their living images present to us.

Unfortunately, the well-known discrepancy between French and British statistics will not allow me to quote any figure which can be undisputed. Of course, it is more important to keep our eyes on the proportion between figures and their movement during a given period than on the figures themselves; but we find that the proportion also is sometimes not the same when we refer to French or to British documents. The methods adopted by the officials responsible for that work in each of the two countries are somewhat different. The value of goods is ascertained by the British Customs from declarations, while in France it is determined by a Commission who annually fix the average price of every article according to all available data. Until a recent date (1904) the British Customs took into account only the port which the goods were sent from or consigned to. Countries without a sea coast, like Switzerland, or sending their goods through another country, were either left out altogether, or inaccurately represented. Though that system has been abandoned, I am told by competent people that something of it still survives. On the other hand, the French method for distinguishing between "commerce général" and "commerce "spécial" has peculiarities of its own. It would be desirable to induce great nations to agree to a uniform system of classification and valuation in their trade statistics. But probably administrative traditions (sometimes disrespectfully termed red tape) make this a Utopian aspiration. For the present we shall have to quote either the British or the French figures: the French may be in some respects more accurate, but except when they differ widely from those of the "Annual Statement of the Trade of the United Kingdom "with Foreign Countries," or when they cannot be found in that document, I shall not refer to them so as not to dwell unduly on comparatively unimportant differences. To deal scientifically with this technical question rests with qualified statisticians, a title I have no right to assume.

I.—*Total trade between Great Britain and France before the War.*

Let us first have before us the total volume of trade between the two countries immediately before the war.

In 1913, France sent to the United Kingdom goods valued at 46,352,718*l.*, 40,810,031*l.* of which were retained in this country. She received from Great Britain goods to the value of 40,881,707*l.* (28,932,988*l.* being British produce and 11,948,719*l.* Foreign and Colonial goods). The figures in the *Annuaire Statistique* are decidedly higher. (Exports to France: 45,360,000*l.* Imports from France: 57,847,000*l.*). These figures should be compared with those of the total foreign trade of each country. The imports of the United Kingdom amounted to 769,000,000*l.* (of which 659,000,000*l.* only were real imports, being retained for use or consumption in the

Kingdom). British exports amounted to 635,000,000*l.* (525,000,000*l.* of which were British produce). Taking the smaller figures corresponding more or less to what the French call "Commerce "spécial," we find that French imports and exports, in the figures of the Annual Statement amount respectively to 7 per cent. (imports into United Kingdom) and 7·8 per cent. (exports into France).

The total imports of France being 8,508,000,000 francs (340,320,000*l.*), and her total exports 6,875,000,000 francs (275,000,000*l.*), the proportion to these total figures of imports from and exports to the United Kingdom is, according to French documents, 13 per cent. and 21 per cent. This makes evident the fact that the trade between the two countries is comparatively more important for France than it is for this country, French exports to the United Kingdom alone amounting to one-fifth of what France sells to all countries. In the foreign trade of Great Britain, France as a buyer of British goods comes only after India (75,500,000*l.*), Germany (40,600,000*l.*) and Australia (34,500,000*l.*), the figure for the United States being almost equivalent to the French one. If we take into account the articles sold but not produced by this country, France comes before Australia but after the States. A huge nation like Russia, rising Dominions like Canada and New Zealand, or a rich country under the influence of British capital like the Argentine Republic, have been till now less important customers than France. On the other hand, this country bought from France more than she did from any other country, except the United States (141,000,000*l.* imported, 130,000,000*l.* retained) and Germany (80,000,000*l* imported, 76,000,000*l.* retained). French imports ranked before those of any of the great Dominions and Colonies, including India, part of whose consignments to British ports (practically one quarter), is re-exported, bringing down practically to 36,000,000*l.* a nominal figure of 48,000,000*l.* Canadian imports into Great Britain are but three-quarters, Australian imports about three-fifths, imports from New Zealand only two-fifths of those from France.

If we now examine in the same way the place of Great Britain in the foreign trade of France, we find that this country ranks first both among the buyers and sellers. In 1913, France imported 1,115,000,000 francs from the United Kingdom, 1,068,000,000 francs from Germany, and 894,000,000 from the United States. It should be noticed how near the German was to the British figure, and this was quite a recent fact: in 1880, German imports into France were not more than one-third of British imports; in 1890, they had risen to more than 50 per cent.; in 1900, they reached 60 per cent.; in 1905, 80 per cent., and in 1910, 90 per cent. Great

Britain, in 1913, bought from France goods to the value of 1,455,000,000 francs, while Belgium bought 1,108,000,000 (part of which probably re-exported to Germany); Germany itself, 866,000,000; Algeria, 552,000,000; the United States, 422,000,000; Switzerland, 406,000,000. This country has not only been for decades and centuries France's best customer, but is even now unrivalled as such. There have been sometimes complaints on the French side about the profits made by British merchants who re-export French goods, and the lack of enterprise of French merchants who might secure these profits for themselves. But the part played by the British trader as carrier and middleman has more to do with what he sells to France than with what he buys from her. Re-exports amount to about one-sixth of what Great Britain sends to France, but only the ninth part of what she buys from France is subsequently re-exported.

If we now consider what the trade between this country and France has been in a succession of years, we shall be helped by the interesting figures and curves published, on the occasion of the Franco-British Exhibition of 1908 by the French Ministry of Commerce, and entitled *Un Siècle de Commerce entre la France et le Royaume-Uni*. For eighty years, beginning in 1827, the average decennial figures have been the following:—

Million francs.

	Exports.	Imports.		Exports.	Imports.
1827–36	22	65	1867–76	616	927
1837–46	80	97	1877–86	622	900
1847–56	127	280	1887–96	527	965
1857–66	459	694	1897–1906	585	1,206

For the decade ending 1913 the figures were the following:—

Million francs.

	Exports to France.	Imports from France.		Exports to France.	Imports from France.
1904	524	1,217	1909	887	1,266
1905	593	1,260	1910	931	1,279
1906	751	1,298	1911	994	1,220
1907	883	1,373	1912	1,048	1,361
1908	794	1,183	1913	1,115	1,455

The curves show (1) that French exports into Great Britain have always been ahead of British exports to France; but the difference has been gradually reduced in the last few years (not to speak of the war period, when this country, for obvious reasons, has sent far more to France than she could receive from her). It should be borne in mind that France pays annually part of this difference in freights for the carriage of her goods in British ships. (2) The periods of rapid progress of both exports and imports have on the whole remarkably concurred with the political rapprochements of the two countries : this was equally noticeable at the time of the first Entente Cordiale, after the Crimean War and during the years of friendly relations since the agreements of 1904. Other causes, no doubt, are also responsible for it. Those periods were prosperous ones not only for our two countries in their mutual relations, but for other countries as well, some of whom made remarkable progress without owing anything, it seems, to the Entente Cordiale. Germany, in the last decade before the present war did, as we all know, advance her trade more rapidly than either of us. Her exports to France since 1901 had risen from 402,000,000 francs to 1,069,000,000, and her imports of French goods from 443,000,000 to 867,000,000. Friendly relations between France and England could not account for the general prosperity of Europe. But they always coincided with it, as they will, we trust, restore it when this war has been brought to a victorious conclusion.

II.—*Commercial relations between the French and British Empires.*

While France and Great Britain have traded with each other for centuries, commerce between France and the British Dominions and Colonies, and between this country and the Colonial Empire of France is quite a recent development. It is already worth consideration, and is certain to become more and more important in the near future.

All the commercial possibilities of the French Colonies (I include in them Algeria, technically not a colony, and the protectorates of Tunis and Morocco) have hardly been realized as yet. In 1913, their total exports amounted to 1,537,000,000 francs, and their imports to 1,701,000,000 ; that is to say, 61,500,000*l.* and 68,000,000*l.* Such figures make the foreign trade of the French Colonies equal to that of wealthy Brazil, and of the huge Chinese Republic, and far superior to that of an old country like Spain (40,000,000*l.* and 47,000,000*l.*). Algeria alone in 1913 bought goods worth 29,400,000*l.*, while her sales abroad amounted to 22,500,000*l.*, figures which are superior to those of the foreign trade of New Zealand (22,000,000*l.* imports and 23,000,000*l.* exports) and about equal to those of a promising country like Roumania. That trade has risen very rapidly, growing in twenty years, by 250 per cent. in the case of Algeria, 300 per cent.

for Tunis, 400 per cent. for Indo-China and 1,000 per cent. for Madagascar.

It has been a subject of frequent complaints in this country that the fiscal system prevalent in French Colonies was of a highly protectionist nature, tending to make trade with them a national monopoly for France. I shall not attempt to discuss this question, but things being as they are the United Kingdom's exports to the French Colonies amounted in 1913 to 5,250,000*l.*: West Africa buying British goods worth 1,479,000*l.*, Algeria 1,340,000*l.*, and Morocco 1,222,000*l.* Since 1910, the progress of British sales to the French Colonial Empire had been as follows:—

1910.	1911.	1912.	1913.
£ 4,105,000	£ 4,566,000	£ 5,012,000	£ 5,250,000

This shows a rapid increase in a few years and, limited as it was by high tariffs, British export trade to the French Colonies was more than equal to what this country sent to the whole of Turkey in Asia (5,165,000*l.*), more than her sales to Austria Hungary (4,482,000*l.*); and this, undoubtedly, is but a beginning. The imports from the French Colonies into the United Kingdom in 1913 amounted to 4,274,000*l.* of which goods valued at 3,725,000*l.* were retained in this country. Algeria's sales between 1910 and 1913 grew from 1,123,000*l.* to 1,311,000*l.*, having reached 1,403,000*l.* the year before. West Africa and Tunis respectively sent 888,000*l.* and 858,000*l.* worth, the figures having previously exceeded 900,000*l.* China's exports to Great Britain were just a little behind those of the French Colonies.

But the trade between France and the British Empire is, as may be expected, far more important. In 1912, according to the French statistics, the British Dominions and Colonies sent to France goods worth 787,600,000 francs (31,500,000*l.*). India alone sent 356,000,000 francs worth, and Australia 262,000,000 francs. The sales of French goods to British possessions were much less (146,700,000 francs or 5,870,000*l.*). The difference can be easily accounted for: while France needs the raw materials which her own Colonies have not yet been, and in some cases may never be, able to supply, the British Possessions find most of the manufactured articles they want in the Mother Country. So that the balance is entirely favourable to the British Empire. In the last few years before the war, that trade was growing rapidly, a fact which will be aptly illustrated by the instance of Canada. In spite of the old ties between Canada and France, and of the existence on the banks of the St. Lawrence of a French-speaking population of about 2,500,000, the total trade between the two countries amounted in 1901 to no more than 14,600,000 francs, and in 1907 did not reach 20,000,000 francs. In 1912, Canada bought from France articles to the value of 29,000,000 francs, and sold 9,500,000 francs worth. British India's exports to France from 1901 to 1912 rose from 191,000,000 francs to 356,000,000 francs (387,000,000 francs in 1910), while imports of French goods into India amounted in 1901 to 20,000,000 francs, and in 1912 to 34,000,000 (42,000,000 in 1910).

Before we leave this subject, I should like to mention that a large proportion of the goods re-exported from the United Kingdom to France (11,000,000*l.* worth in 1913) are Colonial goods, and out of the 5,500,000*l.* of French goods which this country does not retain, the greater part goes to the British Dominions and Colonies. This applies particularly to such articles as Australian wool, jute from India, and French china, cotton lace, and silk stuffs. Even if we do not take into account such indirect sales, the trade between the two Empires can be summarized by the following figures, which are certainly some millions behind the actual ones. Total sales of France and her Colonies to the British Empire: 56,144,000*l.* Total sales of the British Empire to France and her Colonies: 66,750,000*l.* Thus, while France alone sells to Great Britain alone more than she buys from her, the proportion is reversed when we consider the commercial relations between the vast territories grouped under the British and the French flags.

But total figures of exports and imports, though it is necessary to bear them in mind, cannot show us the nature of trade relations between two countries. Their growth may conceal conflicts of interests, both economic and political. Trade between Germany and the United Kingdom has grown, as we know, more rapidly than between this country and France. The question is, whether the profits arising from the large sales of British and Colonial goods to the German consumers were not more than counterbalanced, in the long run, by the fact that so many articles of German origin went to all parts of the world to undermine British industries and jeopardize their future. German chemicals, German metal work, were in direct competition with British produce on the British market, or prevented the growth of enterprises for which this country has the same natural facilities as Germany herself. If we now look more closely into the classes of goods which are exchanged in normal times between Great Britain and France we shall be in a position better to understand what is the solid basis of their commercial understanding, and why it can be considered as a lasting one.

III.—*Nature of the goods supplied by France to the United Kingdom.*

How France and Great Britain, by virtue of their natural conditions and aptitudes, supplement each other for the benefit of both, is a view which has been often propounded. Nobody has explained and justified it so well as M. Jean Périer, the French Commercial Attaché, in the admirable reports he has sent to the French Government since 1901. I cannot do better than to borrow from such an unrivalled authority his classification of the articles sent to this country by France, according to the conditions which favour their importation.

The French send to Great Britain, in the first place, articles which are the produce of their soil and climate. Some cannot be obtained in this country and must be purchased abroad. Some, owing to the advantages of natural conditions, are sought after for their quality, and have attained a world reputation which secures them a market wherever consumers can afford to pay for the best articles of their kind. Vegetables come from Brittany, from the valley of the Garonne and from the neighbourhood of Paris, where they can be grown at an earlier date than in English gardens. The fine quality of French beans and peas allows the industry of vegetable preserves to hold its own against colonial competition. Fruit, which not only matures earlier than English fruit, but in the case of peaches, apricots and some kinds of cherries and plums, has more flavour, comes from the Rhône country, Dauphiné, the plains of the Garonne and the rich valleys of Touraine and Anjou. Flowers are sent from Provence, the Riviera (where Grasse is a centre of the perfume industry), the Loire country and, later in the season, from the Paris district, where small plots of ground are cultivated with Chinese care. Wood for pit-props is sent from the fir forests of the Landes in Gascony. Among the indirect produce of French agriculture, the best known is wine, chiefly from the Bordeaux vineyards, Burgundy and Champagne ; also spirits derived from wine, among which the famous brandy from Cognac has always been a favourite in this country, where it has found its best customers ; some olive oil is sent from the Mediterranean countries and is also used in the preparation of the sardines which Brittany ships to British ports.

In the production of all these articles France owes her advantages, not only to nature, but to a long agricultural tradition : this is best illustrated by the special position of the French wines on the markets of the world. From Great Britain itself France meets with no competition. Canada sells fruit to this country, but almost exclusively one sort of fruit—apples. South African and Australian fruit is ripe in the season when there is no fresh fruit in France or England. Australia's vineyards have been for some years supplying this country with wine, which, naturally enough, has become popular. But leaving aside the question of difference in quality, as far as the highest class of wines is concerned, the quantities imported into the United Kingdom from France and Australia are hardly comparable. In 1913, France's sales of wine to the United Kingdom amounted to 2,123,000*l.*, while Australia's reached only 106,000*l.* And this is not very surprising if we consider that, the year before, the production had been 6,000,000 gallons for Australia and 1,306,000,000 for France. I will not at present deal with the question of competition from other European countries, on which I intend to dwell later.

Some of the agricultural produce of France owes its advantages not so much to the climate as to the aptitude of the producer. Scientific farming has begun in this country and, undoubtedly, whoever now undertakes agriculture on a large scale is more or less the disciple of the great English farmers. Breeding is an English science and art. But France, owing to the distribution of land property among a very large number of small holders, has kept her peasantry, whose feeling towards the land so many of them can call their own, and minute care in their traditional work, make them all agriculturists, not mere agricultural labourers. The part played by women on the land is very considerable, and the farmer's wife is personally responsible for some of the finest produce of the French farm. This applies particularly to poultry and dairy produce: for quality, fowls and eggs from the west of France (Normandy, Brittany, Vendée and Poitou) have a special reputation, and so-called russet eggs (those which sell best on the London market) are supplied mostly from there. For quantity, France, as we shall see, is not now in a position to compete with Denmark and Russia, not to mention less powerful competitors. It should not be forgotten that French agriculture does not chiefly produce for exportation, and that France finds most of her food within her own boundaries.

Manufactured articles from France are sold in this country for reasons similar to those which favour the sale of French brandy or French prunes. They are specialities, and the care with which they have been prepared, or the taste displayed in their execution, account for their success. The French workman in the export trades has much of the craftsman; he is resourceful and likes to do things neatly. The difference between the French and the British, American and German workman should not be exaggerated, but, undoubtedly, in this age of machinery and repetition work, the very causes that have somewhat delayed the growth of modern industry in France, have kept among her working people a tradition of individualism and craftsmanship.

Silks rank first, manufactured silk articles imported here in 1913 reaching the value of 6,113,000*l*. They come from Lyons and St. Etienne, where silk ribbons are manufactured. Woollen fabrics come next, and this is not so generally known. They were produced chiefly in Roubaix, Tourcoing and Rheims. The Germans have taken great care to destroy that industry by removing the machinery from all the places they now occupy and, in the case of Rheims, by blowing the factories to dust. In 1913, France had sold to Great Britain 3,721,000*l*. worth of woollen manufactures. It seems rather surprising : sending cloth to Bradford and Leeds sounds like carrying coals to Newcastle. But as a matter of fact France, who bought 30,847,000 francs worth of woollen fabrics from Yorkshire, did not send the same sort of articles to England. What she sent was the kind of material which, on account of its finer texture and the choice of its colours, is more suitable for ladies' wear. The same observation applies to the French exports of cotton fabrics, including cotton lace, specialities of Rouen, Roanne, Tarare and the Vosges country : except for certain kinds of dyes and prints which make their reputation, French cotton goods, of course, would never be wanted here. This leads us to the very important chapter of apparel, which, in the statistics of French exports to Great Britain, means almost exclusively articles of clothing for ladies. The fact that Paris is the acknowledged metropolis of fashion for women is an important asset for the French export trade, and France owes much to the deft finger of her seamstresses. Apparel and millinery sent across the Channel in 1913 were, according to the French statistics, worth some 5,000,000*l*.

Apart from what is chiefly a matter of taste, the craftsman's inventive mind and minute accuracy explain the favour shown to Paris goods (articles very difficult to define). Paris, in spite of the competition of Brussels, Vienna and some German cities, sent to Great Britain in 1913, 82,814,000 francs (3,312,000*l*.) worth of fancy goods, including buttons, fans, brushes and artificial flowers. The amount of French jewellery sold in this country was not very large, but precious stones were frequently sent over from here to the Jura to be cut. Limoges and Baccarat found a market here for some of their best porcelain and cut glass. The common character of all these articles of exportation is very conspicuous, and can also be noticed in the leather goods, worth 1,474,000*l.*, which were received from France in 1913, while this country sold to France leather goods of a heavier nature to the value of 408,000*l.* In the case of the French motor cars (worth 2,378,000*l.*), there had been at first, when that trade began in France, no competition, and this being no longer so, the figure had not moved forward for some years; yet certain French firms had kept their market even in the country of Rolls-Royce.

To sum up, the French exports to Great Britain, if not all articles of luxury, are choice articles, such as only wealthy countries will buy. This was illustrated by the trade relations of France with some other countries whose wealth had greatly increased in the last decades. French imports to Germany between 1893 and 1913 had increased from 336,000,000 francs to 870,000,000. In Belgium, from 505,000,000 to 1,120,000,000 francs. To the Argentine, since that country had emerged from her internal troubles, from 60,000,000 to 199,000,000 francs. The prosperity of the finest French industries may be looked upon as a sort of barometer, showing the ups and downs of the wealth of other nations, and not only in Great Britain, but in the other markets of the world, that prosperity is not based on competition with British trade.

IV.—*Nature of the goods supplied to France by the United Kingdom.*

The same kind of analysis, applied to the British exports to France, will show us a very different picture.

In the first place, we find goods for the production of which nature, or the development of economic history, has put this country in a privileged position. If France reaps the advantages of her varied and genial climate, Great Britain has her mines, and above all her collieries. France is far from finding in her own territory the supply of coal indispensable to her industries. The average output of coal in France, from 1908 to 1912 was 38,800,000 tons per annum, and her average consumption 57,560,000 tons. The figures for 1913 were: output, 41,390,000; consumption, 61,000,000 tons. More than a half of the deficiency was made good by British coal, mostly from South Wales, as the following figures will show:—

	1910.	1911.	1912.	1913.
Tons	9,754,000	10,448.000	10,359,000	13,034,000
Worth £	5,346,000	5,636,000	6,016,000	8,291,000

The progress of exports of British coals to France kept pace with the progress of French industry. We can hardly lay too much stress on the vital importance of this trade for France, though she is not, like Italy, totally deprived of coal mines, and has immediate neighbours (Belgium and Germany) who, in time of peace, could supply her with the other half of what she required. During this war, the enemy occupying territories from which about two-thirds of the total output of the country were obtained, and all communications with Germany and Belgium having ceased since the beginning of August, 1914, British coal has become more indispensable than ever, and without it not only war industries, but every kind of industry, would have to stop.

The export of iron and steel and manufactures thereof to France cannot be explained by the difference of natural resources, but by the earlier development of the iron trade in Great Britain. France is abundantly provided with iron ore, even more so than the United Kingdom, for in 1912, while the output of the Kingdom was 13,790,000 tons, the French output was 19,160,000 tons. But this was due to quite a recent development, the enormous resources of the mines in Northern Lorraine, close to similar mines in German territory and the Grand Duchy of Luxemburg, having become available only since the beginning of this century. In 1890, the output of iron ore for the whole of France was barely three and a half million tons. This is why the metal and engineering trades of the country were still partly undeveloped when the war broke out, just after the exploitation of new mines in Normandy promised to put fresh resources at the disposal of ironmasters and engineers. France bought from Great Britain (chiefly from Middlesbrough) pig-iron, steel, tin, plates for ship-building and complete hulls, and also a good deal of machinery, mostly textile and agricultural. The figures were as follows :—

	1910.	1911.	1912.	1913.
	£	£	£	£
Iron and steel	1,021,849	1,386,298	1,532,494	1,575,790
Machinery	1,870,464	2,273,595	2,180,250	2,395,783
Ships	386,056	273,829	279,677	358,537

The comparatively small importance of the last item is accounted for by the fact that so much French trade was carried, not only in British made, but in British owned ships. The decline of the French mercantile marine is one of the sad features of French economic history in the last forty years.

The second class of goods exported to France was that of manufactured articles of general use, which this country is better equipped to produce by large quantities and at moderate prices. Such are the cotton yarns and tissues.

1910.	1911.	1912.	1913.
£ 1,387,481	£ 1,322 382	£ 1,350,103	£ 1,120,369

Also the woollen and worsted manufactures, which play the same part in the making of men's clothes in France as the French cloth in the making of ladies' apparel here.

1910.	1911.	1912.	1913.
£ 1,614,137	£ 1,714,229	£ 1,811,654	£ 1,760,683

Leather manufactures, including boots and shoes, renowned in France for their stoutness and reliability, were represented by the following figures :—

1910.	1911.	1912.	1913.
£ 1,075,865	£ 1.145,103	£ 1,288,376	£ 2,790,614

Another article of the same class is manufactured rubber of which 340,000*l.* worth was exported in 1913.

Motor cars, a much more important item, were becoming popular in France, but the quantity exported was only about one-fifth of the imports from France :—

1910.	1911.	1912.	1913.
£ 417,464	£ 323,211	£ 358,212	£ 475,686

The third class into which the exports to France may be divided, that of raw materials, was mainly of foreign and colonial origin. France came to this country for wool from Australia and New Zealand, for rubber from the inter-tropical countries, Indian jute, skins and furs and ornamental feathers. The figures for 1913 were : Rubber, 1,876.506*l.* ; wool, 3,591,835*l.* ; jute, 1,209,594*l.* (a remarkable increase since 1910, when the exports of jute to France amounted only to 350,312*l.*); skins and furs, 792,223*l.*; ornamental feathers, 675,358*l.* This is part of what the British merchants have to distribute among the nations in their capacity of carriers and warehouse-keepers of the world.

While French produce found a readier market in Great Britain in proportion to the increase of British wealth, British produce sold in France in proportion to the increase of French industrial activity. Britain bought for consumption, France for transformation and production. France found in this country some of the indispensable elements for the growth of her own industries. British coal, metals and machinery, and raw materials from the British Empire were helping France to develop her wealth.

V.—*Fluctuations and Competitions.*

The relative importance of the transactions we have attempted to classify, with the help of M. Jean Périer, cannot be entirely realized unless we show by some typical instances, (1) how they compare with each other at the same period, (2) how they have varied at different times, and (3) how they compare with the sales or purchases of the same goods to or from other countries.

The proportion between the three main classes of goods sent from Great Britain to France, according to the usual classification of trade statistics, was as follows:—

	Thousand pounds.
A. Food and drink	1,105
B. Raw materials	9,483
C. Manufactured articles	17,425

The predominance of manufactured articles emphasises our observations on the character of British sales to France. But the proportion alters considerably if we add the foreign and colonial produce re-exported from Great Britain. The total figures are:—

	Thousand pounds.
A. Foodstuffs	1,744
B. Raw materials	18,948
C. Manufactured articles	19,267

It should be noticed that part of the manufactured articles sent to France are, in fact, semi-manufactured, and bought for transformation in the French factories, thus helping French industry, not superseding it. Wool tops, wool yarns, worsted and alpaca yarns exported to France in 1913 amounted to 385,000*l.*, cotton waste and yarns to 854,000*l.*

If we now consider the variation of such figures during a succession of years, we shall find that the first class of goods has made little progress during the last twenty years, and this is not only due to the fact that the French population has not substantially increased, but that this country has not much food to sell abroad, while Colonial goods like tea, coffee and cocoa, come to France mostly from non-British sources. The class of raw materials, on the contrary, shows most remarkable progress. The export of coal to France, thirty years ago, oscillated round two millions sterling, and hardly exceeded three millions twenty years ago; then the figure rose very rapidly to eight million pounds in 1900, and after some fluctuations reducing that figure to a little less than four millions in 1904 and 1905, the curve again took an ascending direction, reaching in the last four years before the war the figures we have quoted before. But if we follow the French statistics those figures are still higher :—

	1910.	1911.	1912.	1913.
£	5,346,000	5,636,000	6,016,000	8,291,000
Francs	185,232,000	208,100,000	224,459,000	280,645,000

I leave the explanation of this to the French and British Customs. Considering that no disagreement in the matter of classification is possible as far as coal, coke and manufactured fuel are concerned, and that the rate of exchange, in 1913, was between 25.15 and 25.20 per £, the difference between the declarations received by the authorities here and the valuations of the "Commission des Valeurs" is not enough to fill up the gap. Statisticians, it seems, are not mathematicians, though they use figures; but astronomers in similar cases say that a few million miles, more or less, do not prejudice the soundness of their conclusions.

Let us now take the exports of manufactured articles. The value of machinery sent to France thirty years ago was about 340,000*l*. Twenty years ago it had risen to 1,040,000*l*. In 1907, the figure reached 1,500,000*l*. We have seen that in 1913 it was 2,395,000*l*. Woollen and worsted manufactures had been fluctuating rather irregularly, making little progress until the last few years. Between 1906 and 1913, they rose from 1,100,000*l*. to 1,760,000*l*. The exports of cotton manufactures have been even more irregular, reaching their highest level (about 1,500,000*l*.) in 1882, falling to 1,000,000*l*. in 1897, and rising slowly to between 1,300,000*l*. and 1,400,000*l*. in 1910–1912, to fall down again to 1,120,000*l*. in the year before the war. Iron and steel do not show a more decided progress. Twenty years ago the figure was not more than 320,000*l*., according to French official statistics. The maximum was, in 1900, 1,046,000*l.* In 1905, it fell again to 150,000*l.*, and after yearly fluctuations was, in 1913, 712,000*l.* Here again we are faced by the most appalling discrepancy between the French and British reports, the figures from British sources being 1,575,000*l.* instead of 712,000*l.* But here it is probable that a difference in the definition accounts for it, and the fluctuations remain about the same.

On the whole these figures do not show any very marked progress, except for coal (and also, if we deal with Colonial produce, for such raw materials as Australian wool, jute and feathers). The cause of such a state of things is not a stagnation in the purchasing capacity of the French nation, whose imports have been steadily rising, being, on the eve of the war, more than double what they had been twenty years before. But there had been increasing competition on the part of other nations. German imports into France were 351,000,000 francs in 1890 and 1,068,000,000 francs in 1913. American imports in the same period had increased from 317,000,000 francs to 788,000,000 francs. Even in the case of coal, for which this country stands in an unrivalled situation in Europe, Germany was sending 6,000,000 tons in 1913 and Belgium 5,000,000, against 11,500,000 tons from this country. This, it must be said, is due mostly to geographical conditions, because Belgian coal can be sent easily to the north of France through canals and waterways, while German coal was wanted in the iron districts of Eastern France, which were without connection by canal with the sea ports. German machinery had long ago taken the lead before British machinery, the amount for sale of German machinery in France being as follows :—

Thousand francs.

1910.	1911.	1912.	1913.
105,700	120,900	131,900	134,000

the British figures being, according to the *Annuaire Statistique* :—

53,400	59,450	59,600	67,500

American machinery was also making progress, reaching, in 1913, the figures of 57,200,000 francs.

In the manufacture of chemicals, in which the achievements of the Germans are well known, they had been progressing for some years by leaps and bounds, and it must not be forgotten that part of the chemicals imported from Belgium came also from Germany :—

Import of Chemicals into France.

Thousand francs.

From	1910.	1911.	1912.	1913.
Germany	48,031	58,494	61,292	70,526
Great Britain	18,757	24,319	25,160	28,457
Belgium	24,127	22,078	24,968	22,360

Tools, and similar metal work, an old speciality of this country, came now from Germany in much greater quantities than from Great Britain, as the following figures will show :—

Thousand francs.

From	1910.	1911.	1912.	1913.
Germany	34,626	36,509	41,308	43,006
Great Britain	13,770	14,829	17,681	17,677

This is not surprising if we remember that Germany, in 1913, was sending rather more "Paris goods" to France than France was sending to her (19,084,000 francs against 18,621,000 francs).

The question of the future prospects of British trade in France is very much the same as that of how best to deal with German competition after the present war.

Turning to the goods sold by France to the United Kingdom, we find that they are distributed among the three great classes of imports in the following proportion :—

	Thousand pounds.
A. Foodstuffs	9,247
B. Raw materials	6,278
C. Manufactured articles	29,550

What is striking is, of course, the much greater place than in the British figures occupied by foodstuffs ; but still more, and more unexpected, too, is the relative importance of manufactured articles, of which France sends to this country more than 60 per cent. in excess of what she receives from the United Kingdom. This should be remembered when we are tempted to think of France as being chiefly an agricultural country. It was not always as it is now : until about the time when Cobden negotiated with Napoleon III the famous treaty of 1860, foodstuffs had kept the first rank among French imports. The predominance of manufactured goods has increased ever since.[1]

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[1] In 1860 their total value in the list of exports to Great Britain was about 6,000,000*l.*

No curves are more erratic than those representing the imports of French foodstuffs into this country. Wines have been going up till 1897, when they reached about 3,300,000*l.*, then going down by degrees till they dropped in 1913 below 1,400,000*l.*[2] The same thing happened to brandy and other spirits which, at the end of the second Empire, had reached the figure of 1,800,000*l.*, then fluctuated for some time round 1,600,000*l.*, to drop steadily, after 1897 settling down round 800,000*l.* This shows, by the way, that the French spirits and wine, are not, as some people imagine, the staple export trade of the country, and have nothing to do with the increase of French imports into Great Britain, of which they form less than 5 per cent. The story of French butter and eggs is rather a melancholy one. They progressed very well on the British market between the middle of the last century and about 1880. Then their decline began: French butter, of which 3,400,000*l.* worth was sold in the United Kingdom in 1882, fell in 1900 to 200,000*l.* and in 1913 to 1,500,000*l.* Eggs also fell from 1,500,000*l.* in 1877 to 326,000*l.*, in 1913. Vegetables have also declined, for, in 1913, the figure was 320,000*l.* instead of 500,000*l.* ten years before. The sale of French fruit, on the contrary, had improved, rising from 580,000*l.* in 1903 to 1,114,000*l.* in 1913. The extraordinary fluctuations in the imports of French sugar cannot be accounted for without a reference to the artificial conditions prevailing before the convention of Brussels: with prices falling in France in consequence of the convention, the internal consumption has absorbed nearly the whole of the French output, and sugar is not now an important item on the list of French exports to this country. If the agricultural produce of France has not on the whole found a larger market in a country in which the consumption of imported foodstuffs has so enormously increased, it is for two reasons.

The first is the development of new countries, with the improvement of means of transport. The second is the application of new methods on a large scale, both for production and sale. This is why French butter, owing to the lack of enterprise of the French dairy farmer, can hardly compete with butter from Denmark, Russia, Australia and Sweden, while from the antipodes, New Zealand sends about as much butter to England as Normandy and Brittany. In 1913, the figures were :—

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[2] This according to the *Annuaire Statistique.* The figures given in the Annual Statement are much higher (2,123,000*l.* in 1913); they may include wines of Italian or Algerian origin.

	£		£		£
France	1,505,442	Russia	3,831,366	Sweden	2,047,634
Denmark	10,657,589	Australia	3,210,733	N. Zealand	1,351,285

For her eggs, France meets with the competition of Denmark, Russia, Italy and Austria Hungary: between 1910 and 1913, the sales from those countries had increased as follows:—

	1910.	1913.		1910.	1913.
	£	£		£	£
Denmark	1,732,107	2,296,843	Italy	350,238	420,914
Russia	3,282,194	4,745,229	Austria	555,998	375,943

For fruit, France remained in a better position, her sales being larger than those of Canada (1,114,000*l.* against 773,000*l.*), and of Italy (735,000*l.*). The figure for Spain is much larger, even leaving aside bananas from the Canary Islands, but out of 3,126,000*l.*, more than two-thirds represent oranges and lemons, of which France can grow only insignificant quantities. As for wines, the value of French exports to this country was, before the war, far superior to that of wines sent from other parts:—

	£		£
France....	2,123,099	Spain	337,100
Portugal	963,244	Italy	56,992

(The French figure is probably swollen, as we have said before, by some Italian wines sent through France).

As buyer of French wine and spirits this country appeared at the top of the list, Belgium and Germany buying respectively about 75 per cent. and 66 per cent. of the British purchase. During the war, Portugal is selling more wine to Great Britain than France. Official statistics do not say how much is consumed by the Expeditionary Force.

There is not so much to say on the subject of raw materials. That chapter is divided into a great many items of no particular interest, and which are often of the same sort, if not exactly of the same quality, as raw materials purchased from Great Britain. This is the case for hides, wool, and rubber. We may mention specially wood, most of which, as we said before, is used as pit-props in the British mines; its value in 1913 was about 1,000,000*l.* (only a small part of the wood imported here, which was worth about

24,668,000*l.*; Russia alone sells to the United Kingdom 13,648,000*l.* worth of wood).

Manufactured goods, in comparison with agricultural produce and raw material, show a remarkable increase.

Silk manufactures, from a little less than 6,000,000*l.* in 1897, rise, after some fluctuations, to more than 8,000,000*l.* (This according to French statistics: there is again disagreement between them and the British Customs). Wool manufactures did not fare so well: during twenty years, the figures have varied between 4,000,000*l.* and 5,000,000*l.*, to be left a little under 4,000,000*l.* in 1913. Apparel, including linen underclothing, amounted in 1903 to 1,500,000*l.*, and was near 1,900,000*l.* in 1913. Cotton goods from France, since 1903, rose gradually from 900,000*l.* to 2,000,000*l.* in 1913. The motor car industry made great progress from 1897, when the exports began, to 1910, rising from 8,000*l.* to 2,600,000*l.* It was in 1913 a little under that figure (2,378,000*l.*). Fancy goods and artificial flowers according to the tables published at the time of the Franco-British Exhibition, grew between 1887 and 1907, from 400,000*l.* to 1,500,000*l.* These exports of manufactured articles are very important for France, as some comparisons will show. Her total exports of silk manufactures in 1913 amounted to 15,000,000*l.*: more than 8,000,000*l.* were bought by this country, the sales in other countries being the following:—

	£		£		£
Germany ..	1,000,000	Belgium ..	2,870,000	United States	1,900,000

The same comparison for woollen manufactures gives the following figures:—

	£		£
Total exports	8,450,000	To United Kingdom	3,700,000
To Belgium	1,200,000	To United States	460,000

For fancy goods and artificial flowers, the proportion was 3,250,000*l.* sent to the United Kingdom, as against 800,000*l.* to Belgium and 340,000*l.* to Germany. French motor cars sold to Great Britain were worth 2,760,000*l.* Those sent to Belgium, 1,860,000*l.*, and to Germany, 1,074,000*l.* Nothing can show better than these figures what total statistics have taught us already, viz., that Britain is France's best customer.

But though most of these French exports are specialities, and as such are not open to the same competition as, say, pig-iron or coal, there was growing competition from certain quarters. The Germans, with their patient methods of imitation and their bold commercial enterprise, were steadily mining the ground under the feet of the French manufacturer, who, unfortunately, had not always the same adaptability. They had followers in Belgium and Switzerland, where they had also many branches and warehouses. In the silk market, they were still far from superseding Lyons and St. Etienne; against the 6,100,000*l.* of French silk goods sold here in 1913, Germany sold only 2,420,000*l.*, Switzerland, 3,260,000*l.* and Italy 864,000*l.* Outside Europe, the only rival at present is Japan (1,200,000*l.*). The situation is not quite so good as far as woollen manufactures are concerned: German woollen goods imported into Great Britain amounting to 2,000,000*l.* against 3,720,000*l.* of French woollen stuffs. The French also kept the lead in motor cars (French imports, 1913, 2,378,000*l.*). But the German, and still more the American, motor cars had been gaining ground in the last few years:—

Imports from	1910.	1911.	1912.	1913.
	£	£	£	£
Germany	1,043,324	1,093,688	1,298,608	1,479,273
United States....	322,288	892,230	1,259,575	1,586,481

But it was chiefly in the field of the infinite variety of small goods known as Paris goods (in spite of their name, and of the reputation of the genuine article), that the Germans were making the most rapid progress. Taking together fancy goods, toys, buttons and studs, bead trimmings, artificial flowers, the figures compared as follows:—

	1910.	1911.	1912.	1913.
	£	£	£	£
France....	1,356,955	1,357,036	1,320,089	1,210,321
Germany	1,963,582	2,098,779	2,339,463	2,481,061

For embroidery and needlework, German imports, which were already five times as large as French imports in 1910, were ten times as much in 1913.

German china and pottery sent to this country was valued at 754,000*l.*, French china at 141,000*l.* Prints, engravings and photographs from France were worth 34,000*l.*, from Germany 455,000*l.* I need not mention the industries, like the chemical industry, in which Germany had taken the lead from the beginning and has practically no rivals.

Everything has been said not only concerning the German methods of economic conquest, but the weak defence of the French trader. His attachment to tradition has its good and bad points : sometimes it means art, sometimes also it means routine ; this is as true in the farm as it is in the workshop. It also applies to commercial methods : even as here you may have dealt with some of those old respectable firms which seem to ignore competition as well as novelties, so in France you will meet with the same pride, and with a sort of disinterestedness, as if the profits which were good enough for the father were without question enough for the son. Many people in France were alarmed at this before the war. After the war we shall live in a very hard world, but where also new opportunities may offer to those who will be bold enough to grasp them.

VI.—*After the War problems.*

I take for granted that we shall win this war, not because it is won yet, but because I decline to make any hypothesis about what would happen, economically and otherwise, if we did not win. We in France consider that the question is one of victory or death. But after victory, we think that a great future will lie before us when the critical period of reconstruction is over. Let us examine how the great problems which we dimly perceive may affect the relations between Great Britain and France.

The war has deprived temporarily France of some of her most important resources, of two-thirds of her coal mines, of more than four-fifths of her iron, of some of her most prosperous engineering and textile districts. The help she is receiving from this country now will have to be extended for our common benefit to those districts during the period of reconstruction. When we recover them, we may expect to find them, if not quite as wrecked as the strip of territory the Germans have just abandoned, at least, for a certainty, deprived of everything which would enable them to resume their former activity. We know that the Germans have not only destroyed machinery in order to seize pieces of copper, worth one thousandth of its value, but have deliberately removed to Germany machines which could be of no use to their own war industries, because their removal will cripple or annihilate industries which in peace time might compete with their own. We must expect to find our factories in ruins, our mines flooded or burning. We do not know what indemnities or compensations it will be possible to demand. But even if we receive them, an enormous effort will be necessary to reconstruct those once prosperous towns, to re-equip farms and workshops. France will certainly make as great an appeal to British industry then as she has made during the war, and this will prolong the period during which our commercial relations, though highly beneficial to both countries, cannot be considered as normal.

When the work of reconstruction is achieved, both France and Great Britain will find themselves economically different from what they were before the great ordeal. This country, not only will have renewed and modernized many of her own industries, but will probably have returned to her ancient agricultural tradition—with the help of steam ploughs, of course. France has become for war purposes a great engineering country. It is a fact, though not a very much advertised one, that, if she has been obliged to come to this country and America for steel and machinery, she has been able to make herself all her artillery and artillery ammunition, all her rifles, almost all her machine guns, and more aeroplanes than she wanted, for she has sent many, with every other class of war material, to less provided Allies. All the plant and machinery, even if part is sent to the districts now occupied by the enemy, will make France much stronger industrially than she was in 1914. Another important factor will be the restoration to France of Alsace-Lorraine. It is a great industrial country. Mulhouse was one of the first centres of the industrial revolution in France. A special interest attaches to the iron mining district, close to the pre-war frontiers of France and Luxemburg, which is geologically of one piece with the mines of Briey and Longwy. In 1913, out of 28,600,000 tons of iron ore extracted from the soil of the whole German Empire, 21,000,000 came from Lorraine. From the political point of view, it is easy to show how important it is (though the claim of the French to Alsace-Lorraine is based on quite different grounds), not to leave that enormous supply of the real sinews of war in the hands of the enemy of European peace. For a converse reason, the pangermanists exhort a victorious Germany to annex the mines of Briey, so as to secure for the Empire permanent hegemony on the Continent. From the economic point of view the possession of those mines by France will have very great consequences. France, with an output of 40,000,000 tons, will become the second producer of iron ore in the world, after the United States. She will have to dispose of that ore; at the same time, even if she can use the coal mines of the Sarre country, she will want more coal than ever from abroad. This will put new problems before our two countries.

France will not, before a long time, be able to use all that ore. Part, no doubt, will go to new furnaces, and to the engineering establishments multiplied by the war. The rest should not, as far as possible, go back to Germany, though it is impossible to imagine that she would have no part of it. It is highly desirable that a certain proportion may be used in this country, and that arrangements should be made to send British coal to the east of France by securing the use of the Rhine and Moselle as international waterways; or, when that district receives coal from the north of France, through the canal which had been planned before the war, British coal will be required in larger quantities in other parts.

We need not be afraid of the fact that France and Great Britain, instead of having only complementary functions, would possess similar facilities for the development of the iron and engineering trades. There is room in the world for both, especially if we consider that what France gains, Germany will have lost, and that the Colonies, China, awakening to modern life, and Russia, freed of her bondage and not yet able to help herself industrially, will offer a wide field to all the foundries and workshops of the world.

Another and very important question is that of the fiscal policy of both countries towards Germany, their own colonies and each other after the war. I can only refer in a few words to this momentous problem. Towards Germany, it is highly probable that we shall have to take measures to limit her attempts at economic invasion, her aims and methods being now exposed. The idea of having no commercial intercourse with Germany does not belong to the world of realities. But we can and ought to take at least some measures to secure some preference on our markets for articles of which we were the original producers, and which, gradually, were being replaced by German imitations. We shall have also—and this has already begun in consequence of the war—to make ourselves independent for some essential, or key, industries. There is room there for much co-operation between friendly neighbours, and, if I am not mistaken, the intentions of both governments concerning the manufacture of dye stuffs will show to the world what Great Britain and France can do when they work together. It is more than likely that closer economic union by the means of preferential duties will be established between Great Britain and her Dominions. I do not think, if this must happen, that France need be afraid of it. I have shown that for most of the articles she sends to this country, there is no real competition between her and the Colonies, any more than between her and the United Kingdom. There is room in the Empire for both the French and the Australian wines, at least for many years to come, and she might send more silk than she does to Melbourne and Cape Town. If her farmers awaken from their commercial slumbers, it will be with Denmark and Russia that they will have to struggle, as will the British producers themselves. The time when our interests might clash seriously is, at any rate, very far ahead.

Whatever system this country and her Empire think fit to adopt for the defence and promotion of their common interests, the only thing France has a right to ask for, is that her relative, if not her absolute position, shall not be injured. I am persuaded that this is possible, owing to the very nature of the goods exchanged between them. Our industrial production and our commercial activity were not antagonistic in peace time. We have known how to stand by each other in time of war. I am fully confident that we shall know how to do it still when our common efforts have brought back to us the blessings of peace. In the past, as we have seen, the more prosperous and wealthy this country was, and the more active and industrious the French were, the better it proved for the mutual trade of the two nations. I hope this will guide our statesmen, as well as our business men, now and on the morrow of the world war, when there will be more need for enterprise, and more reward offered for it, than has been the case at any other period on this side of the Atlantic.

DISCUSSION ON PROFESSOR PAUL MANTOUX'S PAPER.

MR. DRAGE, in proposing a vote of thanks to the author, said that he was sure everyone in the room would join in a hearty vote of thanks to Professor Mantoux, who bore a name already well-known amongst them. Even if it were not for the circumstances which drew them to him to-day, he would always be welcome at the Royal Statistical Society. But they had every reason to be grateful to Professor Mantoux for the Paper in itself. If they were ever to become more closely united with France, it must be on the basis of knowledge, and for the purposes of knowledge it was precisely the frankness which Professor Mantoux had shown in discussing the very thorny problems which underlay his Paper which would make it so valuable to them. He had first and foremost put his hand on a weak point they had recently discussed in that Society, namely, the great variation between the statistics of the two countries, and the joint effort they must make with their Allies, if possible before the end of the war, but at any rate after the war, to reduce those statistics to something not only trustworthy but also intelligible to both nations. He had laid stress on the present faults in some detail, but those of them who had from time to time to try and compare them had frequently had to give up the task in despair. M. Mantoux had referred in eloquent words to the problems after the war. Of course, if they were going to make the resolutions passed by the Paris Conference a reality, the sooner they did as M. Mantoux had done to-day, fully, fairly and frankly faced the facts, the more likely they were to come to some successful understanding. M. Mantoux had referred to the difficulties which existed, and difficulties, as Mr. Chamberlain once said, existed to be overcome. They were many and various. The United Kingdom was at present a free-trade country. Its statesmen were proposing to commence a system of preferential duties and so forth. They knew perfectly well that as for the most part they allowed foreign goods to come in free, their Allies, the Russians, put 140 per cent. *ad valorem* on their goods; the United States put 70 per cent., and France put 34 per cent. He thought that there was only one country that had a higher percentage than those figures of our Allies; that was Austria with 35 per cent. That gave them at any rate something in this country to bargain with when they came to start. He also thought there were questions equally capable of solution like the reservation of the coasting trade which had brought about a certain decline of British shipping in French ports. Then there was the *surtaxe d'entrepôt* which affected more or less the Canadian trade. Turning to another subject which M. Mantoux had illuminated, they were constantly trying to bring home to their own people their own shortcomings, and he was glad that M. Mantoux had mentioned one or two points in connection with the shortcomings both of farmers and the exporters in France, because they had been the causes of the decline of certain branches of French trade in this country. They knew with regard to eggs that the English market had been very largely lost by the French producer owing to the want of cleaning and grading. With regard to flowers, they also knew that one railway would not take the responsibility of them owing to bad packing. In both those respects they had been able to surmount similar difficulties. M. Mantoux knew how very conservative the French working woman was, but they had an even more stiff conservative person to deal with in the English farmer. Sir Horace Plunket had overcome much greater difficulties in Ireland by the method he (Mr. Drage) was going to suggest, namely, if they could find some form of co-operative production and sale in their mutual arrangements with France, he thought a great many of the difficulties which had been mentioned might possibly be overcome, because what was required was an equal standard of quality and an equal and permanent standard of supply. There were many points in M. Mantoux's Paper which were of the utmost interest to him in the reference he had made with regard to the growth of trade of the French colonies with Great Britain. It certainly showed they had very much to learn from their French friends, and the information their French friends could lay before them. He submitted one or two suggestions to M. Mantoux, the first and foremost of them being with regard to the use hitherto made of French capital. France as they knew, was the classic land of thrift, and one of the things that struck their English friends was that she had succeeded in the most marvellous manner in what was called the canalization of capital that was draining the whole of the vast results of thrift of her peasants into institutions like the Crédit Foncier and the Crédit Mobilier, with the unfortunate result that the products of the thrift of the French peasant had gone to bolster up Roumania, Serbia and the various small Balkan States instead of inuring to the benefit of her own industries. He was very glad to see that M. Mantoux laid stress on the necessity of keeping the individuality of the French producer. One of the great movements of the present day was towards standardization. They were constantly told that the great thing was to produce in huge quantities. It would certainly kill all the most striking qualities of French production, taste, and, above all, initiative and inventiveness if standardization were to be universally adopted in French trade. There was one point with regard to the work of officials in France to which he wished to refer. M. Mantoux had dealt with the reports of M. Périer, and he wished to inform them that they in this country always looked with the utmost interest on reports by French Consular Officers. On every occasion they were of the utmost value to them. He was bound to say that M. Mantoux's paper in its concluding paragraphs contained a great deal that was new to him. He had no idea to what extent France had become an engineering country, and if the results which were shown in that Paper could have been attained under the stress of the great war, he thought it went to show that not only was the war going to regenerate and revive all the qualities for which in trade France obtained such a great name, but it also showed that the war would not only as they hoped bring them closer in every respect to France, but would inaugurate an era of industrial prosperity which they hoped might in some way make up to France for the appalling sacrifices she had made to the common cause, the cause of civilization and of liberty to which for centuries France had rendered such distinguished service.

Mr. E. R. P. Moon said it gave him very great pleasure to second the vote of thanks because he had enjoyed exceedingly listening to the Paper which had been one of extraordinary interest. In former days he had borne a part in fostering the friendly relations between France and England by joining that Parliamentary party which paid a return visit to France about 1904. Mr. Drage had touched on the salient points of the Paper, and therefore there was no need for him to do other than formally second the motion.

The President, in putting the vote of thanks to the meeting, said he was afraid he was himself not competent to criticize and comment on M. Mantoux's important Paper, although he had a hereditary interest in the questions discussed as the son of Mr. Cobden's colleague who negotiated with him the Commercial Treaty in 1860 between France and England. He thought one might say that both of those gentlemen would have welcomed the prospect which was opening up of greater interdependence and closer relations between their two countries. He would like to thank M. Mantoux for having taken the trouble which must have been very considerable of preparing this important and interesting Paper. He thought it was a compliment to their Society that he should have done so.

The vote of thanks was put to the meeting and carried.

The author, who was called upon to make a reply, said he had nothing to add.

The following Candidates were elected Fellows of the Society :—

Hon. B. Eastwood.
Jagesh C. Mitra.
Ratan C. Rawlley.
Hugh Reeves.

ON THE MATHEMATICAL REPRESENTATION OF STATISTICAL DATA.

By Professor F. Y. EDGEWORTH, F.B.A.

SECTION V.*—COMPARISON WITH OTHER METHODS.

IT is not enough to show that our method is a good one. To secure its adoption, we must show that it is better than, or at least as good as, any other method which has been proposed for the same purpose. That purpose is defined by the title of my penultimate paper, namely, "the use of analytical geometry to represent certain kinds "of Statistics." The definition excludes *graphs* obtained by smoothing the data without the assumption of an equation corresponding to the graph; such as the plan proposed by G. H. Darwin for treating "fallible observations,"† or Mr. Sprague's "Graphic Method."‡ The "certain Statistics" contemplated consist of frequency groups with a single hump or mode. I am disposed to think that other kinds of groups, in particular those which present a curve descending continually from an initial maximum, are best treated by methods proper to each, for example, the Gompertz, or the Gompertz-Makeham, formula for certain statistics of mortality, and the Pareto income-curve. But if it is claimed for any rival in the representation of unimodal frequency curves that it also lends itself to represent these outlying forms, I should not think it irrelevant to show that our system also possesses this accomplishment.

The field thus narrowed comprises competitors who are compared by Mr. Palin Elderton in his contribution to the proceedings of the Fourth Congress of Mathematicians (at Rome). But it should be noticed that the generalized law of error as understood by him is credited with claims which I do not now make on its behalf. Also the method of translation as now proposed was not before him then.

Accordingly, I may avail myself of his conclusion that "of all "the curves considered those of Karl Pearson are the most useful." If then it can be shown that our method is comparable with the

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* *See* Sections I and II in the *Journal of the Royal Statistical Society*, Vol. LXXIX, and Sections III and IV, *J.R.S.S.*, Vol. LXXX; all which are hereinafter briefly referred to as "*ante.*"

† *Philosophical Magazine*, Vol. (1877).

‡ *Journal of the Institute of Actuaries*, Vol. XXVI (1886).

Pearsonian system, a high place will have been won for it. At least we shall have contributed to that extensive investigation which Mr. Palin Elderton desiderates in order to enable statisticians to appreciate the relative merits of alternative systems.

I should hesitate to oppose my judgment on this matter to that of an authority on the Calculus of Probabilities so pre-eminent as Professor Karl Pearson, if the difference related to the calculative parts of the science. But on the philosophical question what formula is best adapted to the representation of statistics dissent from authority is not paradoxical, and is not inconsistent with the respect due to superior mathematical power.

One difficulty about the comparison is that neither of the compared systems is unique. Professor Pearson's system comprises at least six different types; our system consists of two alternative methods. It must be understood that there is always selected for the comparison that variety of each system which is most appropriate to the matter in hand as indicated by the context.

If the relevant considerations were like so many weights thrown some into one scale, others into the opposite scale, the problem of ponderation would be simple. But the case is rather that there are weights of different classes—as it were stone, wood, feathers—and that a mass difficult to determine of each substance is thrown into each of the two scales. Again it is like a long account with many heads under each of which there is an asset to one of the parties, but against this asset there is a set-off forming an asset to the other party. These points of comparison, the attributes in respect of which advantage is claimed for one side or the other, may be brought under review by predicating each attribute of one or other side, namely, the side which seems *primâ facie* at least to have an advantage in respect of that attribute. There will thus be formed six propositions attributing advantage to the Pearsonian system; and half-a-dozen to ours. They may be summarized as follows.

A. *Propositions in favour of the Pearsonian system.*

1. It has been applied successfully to an immense variety of concrete instances.

2. It is demonstrably applicable to every variety of the cases with which we are concerned.

3. It is typical of observations formed by the interaction of interdependent (or correlated) elements (or causes).

4. It elicits from given observations, and enables us to predict with regard to future observations *in pari materiâ*, the starting-point and finale, the *range*, of a frequency-group.

5. The constants proper to the formulæ in this system are obtained with peculiar ease from the data.

6. The system is distinguished by scientific elegance—the unity of a generic form underlying the variety of the types.

B. *Propositions in favour of our system.*

1. In the extensive class of cases which may be regarded as normal, or nearly so, one of the alternative methods, the generalized law of error, has the advantage of being based on a *vera causa*, a law—perhaps the most universal law—of nature; the other alternative, translation, has the advantage of agreeing closely in fact with the true law.

2. The system is characterized by a simplicity congenial to the purposes of the construction.

3. It is adapted to the representation of frequency-*surfaces*.

4. It admits of being perfected by the variation of the constants so as to satisfy the criterion of a good fit.

5. For its application, to calculate the area subtended by a finite portion of the abscissa, there is required only a simple table, and one that is ready to hand, that of the probability-integral.

6. It is available where, as not infrequently, the data consist of a few *percentiles*, blocks of area so large as to preclude the accurate ascertainment of *moments*.

I proceed to ascertain the net balance under each of these heads which is to be assigned to either side, a balance which under many of the heads by no means agrees with the *primâ facie* claim.

1. The preponderating prestige of the Pearsonian system due to its having been tried and proved in a great variety of instances is not to be disputed. On a smaller scale we, too, have had some successes. In cases adjacent to the normal form Mr. Paliu Elderton found that the generalized law of error gave a good fit. Dr. Bowley also in the same class of cases has employed an abridgment of the law, the "j curve," with marked success. We ourselves have applied the method of translation to barometric statistics in the paper published in this *Journal*, 1898, and to Dr. Isserlis' examples in earlier sections of the present Paper. These results of translation do not, as appears at first sight, admit of a quite fair comparison with the result of the Pearsonian types applied to the same data. For as to the barometric statistics we have not taken account of the mean *fourth* powers of deviation. And as to the examples which we have borrowed from Dr. Isserlis, his first and third, they are specially adapted to the Pearsonian construction formed by the extraction

of balls from an urn without replacement. The wonder is that the generalized law of error should obtain such success as has been shown in the case of the number of trumps in the first hand at whist. That success fully confirms our reasoning that the law is not confined to the ideal case of observations formed from perfectly independent causes.* But for the purpose of comparing our methods, whether the generalized law or translation, with the Pearsonian types it would be better to select such blends of chance and law, of independent and correlated causation, as occur promiscuously in *rerum naturâ*, rather than those which illustrate the particular kind of interdependence formed by the extraction of balls without replacement.†

The examples adduced pertain to subnormal statistics. In the case of abnormality only one of our methods, that of translation, can enter the lists.‡ But the trouble of calculating the coefficients of translation with an accuracy proper to the comparison proves deterrent. Fortunately, however, I have found one example in which the round values obtained from an inchoate table§ seem sufficiently approximate to afford a fair exemplification of the method; an example, too, treated by Professor Pearson. This example consists of the Statistics as to the Ages of Brides (the Bridegroom's age being between 24 and 25 years) adduced by Professor Pearson in his tenth contribution; || for which our fundamental equations for the coefficients of translation are nearly satisfied by the values $\chi = \cdot 1$ $\lambda = \cdot 1$.¶

Adopting these values, and utilizing Professor Pearson's data, we have for the Mean, 22·1877 for the standard deviation squared, 13·3346, and accordingly for our coefficient a** we have 4·30726. The "constructive median" is at a point distant from the mean $-\frac{1}{2} a \sqrt{\chi}$ *i.e.*, 21·5067. Let the distance of any age measured from this median be x. Then to find the value of ξ (the abscissa of the generating normal curve), the value in absolute quantity, we have the cubic equation $\cdot 1\xi^3 \pm \cdot 3162\, \xi^2 + \xi = x/4\cdot 03726$: the positive or negative sign to be used for the coefficient of ξ^2

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* *Ante*, p. 462, and references there given.

† This handicap on our system is less serious than might be supposed; for reasons given below (p. 426 *et seq. Cf.* p. 433).

‡ For reasons given in Section III; *ante*, p 83.

§ For the construction of the table see *J.R.S.S.*, Vol. LXX (1914), pp. 429, 662.

|| *Transactions of the Royal Society*, Vol. 197 (1901) A.

¶ As noticed *loc. cit.* pp. 308, 431.

** $a = \sqrt{2\mu_2}/\left(1 + \chi + 3\lambda + \frac{15}{4}\lambda^2\right)^{\frac{1}{2}}$.

according as the point under consideration is above or below the Median. The results of the calculation are presented in Table XXIV. Table XXV reproduces one of Professor Pearson's tables, the one to which he seems to give a slight preference ;* with an addition purporting to test the fit of the constructed curve. It appears that the fit of our translation is better, judged by a comparison between the sums of errors taken in absolute quantity (without regard to sign). The more elaborate Pearsonian criterion would evidently also be in our favour.

It is a nice question whether this comparison is invalidated by a circumstance which Professor Pearson has adduced to account for certain discrepancies between the given statistics and the figures calculated by his method. He says :—" We are compelled to " consider that there are causes other than chance at work very " definitely affecting the frequency of the *recorded* ages. Thus the " bridegroom being 24 to 25, the desire of the bride to be recorded " as younger than her husband probably fully accounts for the " bulk of the preponderance of observation over theory in the " frequency of the brides of 22 to 24. The defect of brides between " 17 and 20 may be again due to the tendency to state the age as " over 21, and so free the woman from the need for parental sanction. " These causes, giving a false displacement of age frequency, are " probably in themselves sufficient to account for the theoretical " defect in brides of 15 to 17."†

These remarks would appear to me perfectly appropriate if the data were conformable to the law of error, normal or generalized. On such a supposition there would no doubt be " causes other " than chance at work," but they would be so numerous and independent that they might properly be described as not " very " definitely affecting the frequency of the recorded ages." But in the case of a quite abnormal group, I think, we must always consider that there are causes other than chance at work very definitely affecting the frequency recorded. Chance only comes in to this extent : that we may suppose a certain obscure affinity to the genuine probability-curve, the law of error, such a degree of plurality and independence in the causes at work as is sufficient to ensure the unimodality and continuity of the curve which are postulated. Thus in the case before us, one considerable cause for the diminution in the number of brides at the later ages is the paucity of women of those ages. Elderly persons marry less frequently, partly for the

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* "Type VI is the frequency curve to be selected, but . . . we shall probably get a good fit from Type V as well." Pearson *loc. cit.* p. 451.

† *Loc. cit.* p. 454.

TABLE XXIV.—Showing the application of the Method of Translation to an abnormal frequency-group.

X	x	x/a	ξ	H	2θ	ν
					·01613	229·5
16	5·5067	1·2785	1·7013	·98387		
					·03352	477
17	4· ,,	1·04636	1·388	·95035		
					·08961	1275
18	3· ,,	·81414	1·0455	·86074		
					·18039	2565
19	2· ,,	·5819	·7037	·68035		
					·25924	3688
20	1·5067	·3498	·39245	·42111		
					·28394	4039·5
21	0·5067	·11764	·12217	·13717		
					·13717	1951·5
21·5067						
					·124202	1767
22	0·4933	·11453	·11052	·124202		
					·217471	3094
23	1·4933	·3467	·3127	·341673		
					·170704	2429
24	2· ,,	·57886	·4908	·512377		
					·129652	1844·5
25	3· ,,	·81103	·6500	·642029		
					·096425	1372
26	4· ,,	1·0432	·7939	·738454		
					·070895	1008·5
27	5· ,,	1·27536	·92536	·809349		
					·051800	737
28	6· ,,	1·50752	1·0466	·861147		
					·037684	536·5
29	7· ,,	1·73969	1·1591	·898831		
					·027391	390
30	8· ,,	1·97186	1·26431	·926222		
					·019885	283
31	9· ,,	2·20402	1·36315	·946107		
					·014485	206
32	10· ,,	2·4362	1·4565	·960592		
					·010598	151
33	11· ,,	2·66835	1·5449	·971190		
					·007573	108
34	12·4933	2·90052	1·629	·978763		
					·009725	138
36	14· ,,	3 36485	1·7867	·988488		
					·005187	74
38	16· ,,	3·8292	1·9307	·993675		
					·002827	40
40	18·4933	4·2935	2·0649	·996502		
					·003418	50

Notes to Table XXIV.

X is age at marriage.

x is distance, without respect of sign, from the Median 21·5067.

x/a denotes x divided by 4·30726.

ξ is a positive root of the equation $\cdot 1\xi^3 \pm \cdot 3162\xi^2 + \xi = x/a$; the positive or negative sign being given to the coefficient of ξ^2 according as X is above or below the Median.

H is the value $\frac{2}{\sqrt{\pi}}\int_0^{\xi} e^{-\xi^3}\, d\xi$ extracted from Burgess' Tables (*Transactions of the Royal Society of Edinburgh*, 1901) with the aid of first, but not of second, differences.

2θ is the difference between successive values of H.

$\nu = \theta \times$ total number of observations $= 2\theta \times 14227$.

same reason as black sheep eat less than white—there are fewer of them. Supposing that this cause were absent, the age-distribution of brides would no doubt be more nearly normal than it is. The mixed motives, the blend of instinct, interest, and custom, which Quetelet would call the "penchant" towards marriage might well result in some nearly normal distribution, at least for a homogeneous class. But there would probably be serious differences in the constants of the curves pertaining to different classes—*e.g.*, the professional and operative.

Now assume that this jumble of factors large and small (including the first named far from "normal" action of age in diminishing frequency) brings about a distribution of ages at marriage which may be adequately represented by a skew curve of the Pearsonian type. Then superadd another large factor—misrepresentations of age; thereby constituting a new group consisting not of real ages at marriage, but of "recorded" or putative ages. Is there any reason to think that this new group will not possess the characters of continuity and unimodality in such wise as to be amenable to the same kind of treatment as the true statistics? No reason, I think, unless there is ground for supposing that the misstatements are very abrupt and discontinuous, piled up, say, at one particular point, the age of 21, or some one or two round numbers. The misstatements may be of this character, for all I know. But, in the absence of such knowledge, it would appear that the given statistics afford a legitimate arena in which to try a fall, so to speak, between the rival methods. That our method has the advantage in this trial is apparently a fact; but I admit not a very significant fact, a success which may be described as accidental, and only important as presenting an appeal to some equally accidental advantage obtained in some other trial by the rival system.

TABLE XXV.—Comparing the Method of Translation with Type VI of Professor Pearson's System.

X	e_1	ν_1	n	ν_2	e_2	X
	− 318	49	367	229 ·5	− 137 ·5	
16						16
	− 228	489	717	477	− 240	
17						17
	+ 266	1560	1294	1275	− 19	
18						18
	+ 679	2800	2121	2565	+ 444	
19						19
	+ 466	3622	3156	3688	+ 532	
20						20
	− 178	3831	4009	4039 ·5	+ 30 ·5	
21						21
	− 33	3560	3593	3718 ·5	+ 125 ·5	
22						22
	− 570	3034	3604	3094	− 510	
23						23
	− 621	2439	3060	2429	− 631	
24						24
	+ 110	1884	1774	1844 ·5	+ 70 ·5	
25						25
	+ 62	1415	1353	1372	+ 19	
26						26
	+ 107	1043	936	1008 ·5	+ 72 ·5	
27						27
	+ 97	760	663	737	+ 74	
28						28
	+ 81	549	468	536 ·5	+ 68 ·5	
29						29
	+ 76	395	319	390	+ 71	
30						30
	+ 26	282	256	283	+ 27	
31						31
	+ 34	198	164	206	+ 42	
32						32
	+ 12	146	134	151	+ 17	
33						33
	+ 11	105	94	108	+ 14	
34						34
	− 14	131	145	138	− 7	
36						36
	− 23	69	92	74	− 18	
38						38
	− 29	38	67	40	− 27	
40						40
	− 21	37	68	50	− 18	
S $\vert e_1 \vert$	4062				3215	S $\vert e_2 \vert$

Notes to Table XXV.

X is the age at marriage.

n is the observed number named at each age period.

ν_1 is the number calculated according to the Pearsonian Type VI.

ν_2 is the number calculated according to the Method of Translation.

e_1 and e_2 are the errors of the respective results.

$S|e_1|$ is the sum of the errors incurred by the first calculation, in absolute quantity or without regard to sign.

$S|e_2|$ is the corresponding sum for the second calculation.

Note that the respective errors at each extremity are not strictly comparable. For whereas according to the Pearsonian Type the number of observations below 16, viz., 49, lie within 15, the limit of the given observations, according to the method of translation there is a slight protuberance beyond that limit, found by observing that to $X = 15$ there corresponds $\xi = 1{\cdot}973$, to which corresponds $H = 99473$, $\nu = 75$ (out of 28,454). Likewise at the other extremity, whereas the Pearsonian curve does not exceed the actual range $X = 45$, the translated curve has an excess corresponding to $\xi = 2{\cdot}3$; that is, about ·00057 of the area, some 16 observations out of 28,454.

If the successes which we can show are much less numerous than those of the compared system it is to be considered that the trials given to that system have been much more numerous, owing both to its priority and its authority. It may be added that those trials as compared with the work of the present writer have probably been less affected with mistakes in calculation of a kind apt to prejudice the success of the result.*

A. 2. The inductive verification of our method is confirmed by deductive reasoning as to its applicability. An erroneous impression as to the limitation of that applicability may have been obtained from a passage in a former Paper which shows that there is a limit—far removed indeed from ordinary concrete experiences, but still a limit—at which the equations connecting the coefficients of translation with moments supposed to be given cease to have real roots.† There is, indeed, a limit such as was indicated to the use of *moments*. But the use of *percentiles* is not thereby precluded. Percentiles are the more appropriate to the outlying cases in question in so far as the materials for ascertaining the moments are apt in such cases to be deficient.

The truth of these statements will be sufficiently indicated by an example. It is an example which I previously hesitated to attack by way of moments, apprehending that it might be beyond the limiting barrier. This is the example presented by Mr. Palin Elderton in the first table of his *Frequency-Curves* and discussed by him on a subsequent page.* The data are set forth in our Table XXVII, where the central column denotes the number of occurrences (withdrawals) each year. I have interpreted the date assigned to the occurrences as designating the middle point of the period within which the corresponding occurrences took place; *e.g.*, 2 opposite 200, in Mr. Palin Elderton's table, is understood as meaning that 200 withdrawals occurred between the dates 1·5 and 2·5. But if the true interpretation is that 200 withdrawals occurred between the dates 1 and 2, the statement may be modified, without injury to the argument, by a simple change in the origin of the abscissa X which represents number of years.

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* I have to thank Dr. Isserlis for the detection of such a mistake in Table IV of the present Paper (Section I). In the last entry of the fifth row I have inadvertently put, instead of $\cdot 5 - \Theta$ *i.e.*, ·08735, $\cdot 5 - \theta$ *i.e.*, ·13545. The result is much improved by the correction.

† *J.R.S.S.*, Vol. LXXVII (1914), p. 665.

From inspection of the data it appears that the representative curve is of the kind which descends from an infinite ordinate. It is proper that this "break" should occur within the last compartment on the lower side of the Median, that is, left of the point $X = 1·5$. Provided that the portion of the curve to the right of that point gives an adequate representation of the given group, we need not trouble about the occurrences left of that limit; we do not profess to represent the distribution of that remainder.† We are not concerned with the circumstance that the constructed curve after ascending to infinity descends below the abscissa, so as to represent negative frequency!

In view of the descending character of the part of the curve with which we are concerned it may be expected that the Median required for our construction will lie to the left of the point determined by way of proportional parts between 1·5 and 2·5; namely, $2·5 - 8/2000, = 2·46$. Let us take provisionally for the Median, 2·4.

We have now to obtain a first approximation to the coefficients of the operator $a\xi + k\xi^2 + l\xi^3$. For this purpose we may utilize three percentiles.‡ The following are suggested as suitable. First, observing that ·192 of the total number of observations lie between the Median and the point $X = 1·5$, we look out in Burgess's Tables for the value of t corresponding to $H = 2 \times ·192 = ·384$. Whence we obtain for t, our ξ, ·3546. Proceeding similarly for the point $X = 6·5$ which intercepts ·298 of the area, I find for the corresponding value of ξ, ·5908. For the third determination I have tried a rather more convenient, if less accurate, procedure. I have put a sound number for ξ, viz., 1·6, and have determined the corresponding value of X roughly with the aid of "proportional "parts." As thus: to $\xi = 1\cdot 6$ there corresponds $H = \cdot 97635$ and accordingly an intercepted area = ·48817. Now the area intercepted between X = 17·5 and the Median is ·484, between X = 18·5 and the Median = ·490. Accordingly for the required point we may put roughly $X = 18\cdot 1\dot{6}$*; distant from the Median (2·4) $15\cdot 7\dot{6}$. We thus obtain for the determination of the three coefficients a, k, l the three simple equations :—

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* *Frequency-curves*, pp. 8, 103. My reference to this example *J.R.S.S.*, Vol. LXXVII (1914), p. 664, as "an example given by Dr. Greenwood" is inaccurate.

† *Cf. ante*, Section III, p. 81.

‡ *Cf. A method of representing statistics*, by the present writer, Fifth International Congress of Mathematicians, p. 9 (of the Paper).

$$a \cdot 3546 - k \cdot 12574 + l \cdot 04459 = \cdot 9.$$

$$a \cdot 5498 + k \cdot 34916 + l \cdot 20632 = 4 \cdot 1.$$

$$a\, 1\cdot 6 + k\, 2\cdot 56 + l\, 4\cdot 096 = 15\cdot 7\dot{6}.$$

For an approximate solution of these equations I have found $a = 4\cdot 37$, $k = 4\cdot 9$, $l = -\cdot 93$. This system, it will be observed, satisfies the condition that the infinite ordinate lies to the *left* of the point X = 1·5.† For the condition of that break is the banishing of $\frac{d}{dx}(a\xi - k\xi^2 + l\xi^3)$ *i.e.*, $4\cdot 37 - 9\cdot 8\xi - 2\cdot 79\xi^2 = 0$.

The root of this equation is just above ·4; corresponding to $x = 4\cdot 37 \times \cdot 4 - 4\cdot 9 \times \cdot 16 - \cdot 93 \times \cdot 064 = \cdot 9045$. Whereas the distance of the point X = 1·5 from the Median is only ·9.

I employed the aforesaid values of a, k and l in calculating Table XXVI. Unfortunately I had performed the somewhat laborious calculation before noticing that a slight slip in my treatment of the simultaneous equations for a, k, l had rendered the solution inexact. Thus, whereas according to the first equation $a \cdot 3546 + k \cdot 12574 + l \cdot 04459 - \cdot 9 = 0$, in fact, the substitution of the assigned values for the sought quantities makes the right side of the equation, not zero, but ·008. It follows that instead of there being only 192 observations (out of the total thousand), as there ought to be, between the Median and the point X = 1·5, there are 201. Accordingly the last compartment on the left is unduly depleted; becoming 299 instead of 308. This last error could no doubt have been avoided by a more exact calculation; and there is no reason to think that the rest of the Table would have been prejudiced by this modification; on the contrary. As it is—probably even as it would be if this correction were made—our result is not so good as Mr. Palin Elderton's, as appears from the comparison shown in Table XXVII. This comparison as shown there is more to our disadvantage than the comparison shown in Table XXV is to our advantage. But there is this great difference in significance of the two comparisons: that whereas the earlier calculation shown in Table XXIV utilized all the data, in the construction of Table XXVI we have employed only *three* percentiles out of the many, say, *ten*, that are available for the determination of the coefficients. Our result is to be considered as merely a first approximation, which could undoubtedly be much improved by determining corrections of the coefficients, say, δa, δk, δl, and also a correction of the Median, such that, account being taken of all the available percentiles, the Pearsonian χ should be a minimum[*]; after the method shown in previous sections.

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* By proportional parts, a little more; but an allowance may be made for the slope of the curve.

† At this point the length x measured to the left from the Median reaches a maximum. For larger values of ξ the abscissa x moves backwards to the right; while the curve lies *below* the abscissa. These relations have not been quite rightly stated in some of my previous references to the subject.

A. 3. The claim on behalf of the Pearsonian system that it represents observations resulting from *inter*dependent causes, just as the law of error represents observations resulting from *in*dependent causes, has been disputed by me on grounds which I do not retract.[†] It is the peculiar property of fortuitously distributed causes to result in the law of error (normal or generalized). But there is no one representative type for the *negative* of this property. Its absence is exemplified by *any* law in the ordinary sense of the term opposed to chance. Any instance of a logical negative will illustrate the argument. So it is a *proprium* of the law of attraction in proportion to the inverse square of the distance that matter distributed evenly over a spherical shell exercises no (resultant) attraction on a point within the shell;[‡] but the absence of that property is not typified by any particular law of attraction. *Any* other law of attraction will exemplify the negative.

It is true that out of the indefinite number of negatives some one may properly be instanced as being particularly simple and familiar; for example, the law of attraction according to the simple distance. It may be allowed that the problem of drawing balls from an urn without replacement has this recommendation. It is a particularly

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[*] It will be recalled that as χ becomes less *ceters paribus*, P, the measure of fitness, becomes greater, as appears from the value of P in terms of χ given by Prof. Pearson (*Phil. Mag.*, 1900), *Cf. J.R.S.S.*, Vol. 1914, p. 851 note.

[†] See *J.R.S.S.*, Vol. LXII (1899), p. 536.

[‡] Tait and Thompson, *Natural Philosophy*, Art. 462; Bartholomew Price, *Infinitesimal Calculus*, Vol. III, Arts. 198–9.

TABLE XXVI.—Showing the application of the Method of Translation to a very abnormal frequency-group.

X	x	ξ	H	2θ	ν
					299
1·5	·9	·3729	·402		
				·402	201
2·4					
				·025	12·5
2·5	·1	·0223	·025		
				·204	102
3·5	1·1	·206	·2292		
				·1516	76
4·5	2·1	·3514	·3808		
				·119	59·5
5·5	3·1	·4772	·500		
				·0956	48
6·5	4·1	·5906	·5964		
				·0814	40·5
7·5	5·1	·7	·6778		
				·061	30·5
8·5	6·1	·7946	·7389		
				·052	26
9·5	7·1	·8886	·791		
				·043	21·5
10·5	8·1	·979	·8338		
				·064	32
12·5	10·1	1·155	·8976		
				·039	19·5
14·5	12·1	1·314	·9369		
				·026	13
16·5	14·1	1·474	·9629		
				·016	8
18·5	16·1	1·63	·9788		
				·0095	5
20·5	18·1	1·783	·9883		
				·012	6

Notes to Table XXVI.

X = number of years.

x = the distance of X from the Median, 2·4, without respect of sign.

ξ is a positive of the equation $-\cdot93\xi^3 \pm 4\cdot9\xi^2 + 4\cdot37\xi = x$; the upper or lower sign to be attached to the coefficient of ξ^2 according as X is above or below 2·4.

H is the (double) probability integral corresponding to modulus ξ.

2θ is the difference between successive values of H.

ν is the calculated frequency $= 1000\theta$.

TABLE XXVII.—Showing a comparison between the Pearsonian Type I and a first approximation obtained by the method of translation.

X	e_1	ν_1	n	ν_2	e_2	X
	+ 4	312	308	299	− 9	
1·5						1·5
	− 2	198	200	213·5	+ 13·5	
2·5						2·5
	− 17	101	118	102	− 16	
3·5						3·5
	+ 5	76	69	76	+ 7	
4·5						4·5
	− 1	58	59	59·5	+ ·5	
5·5						5·5
	+ 1	45	44	48	+ 4	
6·5						6·5
	+ 8	37	29	40·5	+ 11·5	
7·5						7·5
	+ 2	30	28	30·5	+ 2·5	
8·5						8·6
	− 1	25	26	26	0	
9·5						9·5
	0	21	21	21·5	+ ·5	
10·5						10·5
	− 3	33	36	32	− 4	
12·5						12·5
	+ 1	24	23	19·5	− 3·5	
14·5						14·5
	0	16	16	13	− 3	
16·5						16·5
	− 2	11	13	8	− 5	
18·5						18·5
	+ 3	7	4	5	+ 1	
20·5						20·5
	0	6	6	6	0	
$S\lvert e_1\rvert$	50				81	$S\lvert e_2\rvert$

Notes to Tables XXVII.

X is the number of years.

n is the actual number of occurrences in each.

ν_1 is the number calculated by Mr. Palin Elderton (*Frequency-curves*, p. 103) and ν_2 is a rough first approximation to the number by the method of translation. e_1 and e_2 are the errors respectively incurred by the two calculations. $S\lvert e_1\rvert$ and $S\lvert e_2\rvert$ are sums of errors taken in absolute magnitude or without respect to sign.

obvious departure from the familiar conception appropriate to independent causation, namely, drawing balls *with* replacement.*

But even this recommendation for the scheme which is employed to introduce at least, if not to guarantee, the Pearsonian system cannot be allowed without reservation. For the conception of extracting balls without replacement is seriously deficient in generality in that it represents only *negative* correlation between the causes which go to an observation; the correlation exemplified by the circumstance that every time a black ball is drawn from the urn the chance of drawing a black ball at a subsequent trial is diminished.† That imperfection might be remedied by constructing what may be the *external case* of the problem; the arrangement that every time a black ball is drawn we should not remove it, thereby causing the number of black balls in the urn to be less by one; but should replace it with an additional black ball, thereby causing the number of balls to be greater by one. The problem may be treated on the same lines as the more familiar problem, by a mere change of sign.‡

But although the scheme has lost something of its simplicity and familiarity by this modification, it still has no exclusive claim to be at least the best of what may be called bag and ball illustrations of interdependent causes. For, as I have pointed out in a former Paper,§ there is a formidable competitor for that honour, namely, an arrangement suggested by Laplace, that every time a black ball is extracted a white ball should be inserted. The chance of a black ball will thus be diminished. The opposite result—positive correlation between the causes favouring black balls at successive trials—will be secured by taking out a white ball and inserting a black ball every time a black ball has been drawn, as well as replacing the drawn ball. There is a certain simplicity in the interaction of the causes here at work which gives the scheme a claim to be treated as the type of correlated causes.|| No doubt, the expression for the

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* As I have pointed out in my article on "Probability" in the *Encyclopædia Britannica*, § 28.

† This deficiency in generality was pointed out to me by Dr. M. Greenwood.

‡ Writing instead of — as the sign of s (the number of black balls extracted) in the first of the two fractions exhibited below, p. 429, whose product is $\frac{y_{s+1}}{y_s}$.

§ *J.R.S.S.*, Vol. LXV (1902), p. 330. The formula there given is directly applicable only to the case of *adversely* correlated elements: but it is readily adapted to the *external case* stated in the present text.

|| *Loc. cit.*

ordinate representing the probability of every assigned number of black balls drawn is deficient in simplicity; but, as will presently appear, the advantage of the Pearsonian system in this respect is somewhat illusory.

The prerogative for which there are so many candidates—the representation of phenomena produced by correlated causes—is not so important as may be supposed. For at best it can only apply to the main body of a statistical group, but not to the extremities. This appears from considering the argument which connects the hypothetical construction—such as the extraction of balls from an urn without replacement—with the formula from which y, the probability of drawing any assigned number of black balls, is derived. This fundamental formula may be written:

$$\frac{dy}{dx} = y\frac{x + a}{b_0 + b_1x + b_2x^2}.\text{*}$$

I maintain that this formula represents the frequency under consideration only to the same degree of approximation, and over the same central tract of the actual locus, as the method of translation.

Let us approach the problem by way of a simple case, the Binomial, the locus of frequency for balls drawn *with* replacement. Let n balls be so drawn from an urn in which black and white balls are mixed up in the proportions $p : q$; and let y_s be the probability of drawing s black balls. We have then

$$y_s = \frac{n!}{y - s!\,s!}p^s q^{n-s}; \;\; y_{s+1} = \frac{n!}{y - s - 1!\,s + 1!}p^{s+1}q^{n-s-1}.$$

$$\frac{y_{s+1}}{y_s} = \frac{n - s}{s + 1}\frac{p}{q}.$$

This expression may be simplified by taking for the independent variable, instead of s, the excess of s above its mean value, namely, np.† Putting $s = np + t$ we have

$$\frac{y_{s+1}}{y_s} = \frac{y_{t+1}\ddagger}{y_t} = \frac{npq - pt}{npq + qt + q}.$$

I am unable to see how this datum can be made to lead to a differential equation of the accuracy which is claimed. But as my investigation, while following the track of Professor Pearson's, does not quite tread in his footsteps, it is very possible that I have missed something which he has seen.

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* In the notation of Mr. Palin Elderton *Frequency-Curves*, p. 39.

† It would come to the same if we put $s = np - q$, so as to simplify the expression involving $y_{t+1} - y_t$. It may be worth recalling that the mode of the generalized error-curve is at the point $(np - \frac{1}{2}(q - p))\,\Delta x$.

‡ It might be preferable with reference to the new abscissa to use a new symbol for the ordinate, say y, and afterwards to introduce yet a third symbol, $Y = y/\Delta x$.

As I look at the matter, n, s, t are all numbers, not necessarily large numbers. To pass from number to space let us suppose ordinates drawn at intervals of Δx; the unit, or parameter, in which the abscissa x is measured being so taken that a certain number of times Δx should equal that unit. I have recommended as that number C, being* the number $\sqrt{2npq}$; c the parameter for the abscissa should be equated to $C\Delta x$. Likewise $t\Delta x = x$, the abscissa measured from a point which corresponds to the mean number (of black balls extracted). With these conventions if we multiply by Δx^2 the numerator and denominator of the expression above equated to y_{t+1}/y_t, it becomes

$$\frac{c^2/2 - px\Delta t}{c^2/2 + q\,x\Delta x + q\Delta x^2}.$$

Now, as I understand, it is suggested that from a fraction such as our y_{t+1}/y_t there can be obtained an accurate value for $\frac{dy}{dx}$ by equating $\frac{1}{\Delta x}\,\frac{y_{t+1}-y_t}{\Delta x(y_{t+1}+y_t)/2}$ to the value of $\frac{dy}{dx}\Big/y$ when $x = (t+\frac{1}{2})\,\Delta x$.† That is in our notation

$$\left(\frac{1}{y}\frac{dy}{dx}\right)_{x\,=\,(t\,+\,\frac{1}{2})\Delta x} = \frac{-x - q\Delta x}{c^2/2 + \frac{1}{2}(q-p)x\Delta x + \frac{1}{2}q\Delta x^2}.$$

To test this equation let us provisionally assume that Δx is small with regard to c ($\sqrt{2npq}$ being fairly large), and that $x\Delta x$ is small with regard to c^2 (t small with regard to n, say of the order $1/\sqrt{n}$). Then expanding both sides of the proposed equation in ascending powers of Δx, we shall find that the absolute term, the first approximation to the differential coefficient $\frac{d}{dx}\log y$, is identical on both sides, viz.—$2x/c^2$; corresponding to the differentiated index of the normal error function. Next comparing the coefficients of Δx in the expansion on each side of the equation we obtain the less familiar proposition that the second approximation presented by the Pearsonian type (on the provisional supposition here made) is identical with the true second approximation,* that which is presented by the generalized law of error (in the case of the Binomial). So far the Pearsonian type is on a level with the method of translation as being practically coincident with the generalized law up to a second approximation and over a range of about one modulus.† But when we proceed to a *third* approximation and compare the coefficients of Δx^2 on each side of the equation, the identity no longer persists. But this second and the further corrections become more and more significant as we relax the provisional supposition, and suppose Δx to become large ($\sqrt{n}$ being small), or x to become larger than the modulus (t to be of an order greater than $\sqrt{2npq}$).‡ It follows from the latter alternative that

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* *Cf.* "Law of Error," *Camb. Phil. Trans.*, Vol. xx, p. 60; where the radical sign has been omitted by a misprint.

† It is indifferent whether we use t or s in much of the following reasoning. Professor Pearson's symbols may be employed, *mutatis mutandis*; it being observed that his s (which, to avoid confusion, we take the liberty of writing in Roman type) is identical with our $r - s$. Accordingly his $\frac{y_{s+1}}{y_s}$, being the ratio between the probability of drawing $r - \mathrm{s}$ black balls to the probability of drawing $r - \mathrm{s} + 1$ black balls is the *reciprocal* of our y_{s+1}/y_s. This may be verified by substituting in the reciprocal of the expression which he gives for y_{s+1}/y_s *for* s, $r - s$. There results exactly that formula given in the text above for y_{s+1}/y_s. These and other differences of notation and convention do not affect the substance of the argument.

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* *Camb. Phil. Trans. loc. cit.*

† *Cp. ante*, Sect. IV.

‡ Put $\mathrm{x} = x + \frac{1}{2}$; and accordingly write the fundamental differential equation

$$\frac{1}{\mathrm{y}}\frac{d\mathrm{y}}{d\mathrm{x}} = \frac{1}{\Delta\mathrm{x}}\frac{\mathrm{y}_{\mathrm{x}+\frac{1}{2}\Delta\mathrm{x}} - \mathrm{y}_{\mathrm{x}-\frac{1}{2}\Delta\mathrm{x}}}{\mathrm{y}_{\mathrm{x}+\frac{1}{2}\Delta\mathrm{x}} + \mathrm{y}_{\mathrm{x}-\frac{1}{2}\Delta\mathrm{x}}}.$$

The degree of approximation up to which this equation holds good appears from the expansion of the right side in ascending powers of $\Delta\mathrm{x}$, viz.,

$$\frac{1}{\mathrm{y}}\frac{d\mathrm{y}}{d\mathrm{x}} + \mathrm{R}\Delta\mathrm{x}^2 +. \&c.,$$

where
$$\mathrm{R} = \frac{1}{24}\frac{d^3\mathrm{y}}{d\mathrm{x}^3} - \frac{1}{8}\frac{d\mathrm{y}}{d\mathrm{x}}\frac{d^2\mathrm{y}}{d\mathrm{x}^2}.$$

The expression for R remains correct to the same degree of approximation when we substitute the original x for x and for $\frac{d}{d\mathrm{x}}$ the operator proper to *finite differences*, $\frac{\Delta}{\Delta x}$. The differences may be obtained from the expression given in the text for the ratio between consecutive ordinates representing the terms of the binomial expansion As thus:

$$\frac{1}{y}\frac{\Delta y}{\Delta x} = \frac{1}{\Delta x}\left(\frac{y_{x+\Delta x}}{y_x} - 1\right) = \frac{1}{\Delta x}\left(\frac{npq - pt}{npq + qt + q} - 1\right)$$

$$\frac{1}{y}\frac{\Delta^2 y}{\Delta x^2} = \frac{1}{\Delta x^2}\left(\frac{y_{x+2\Delta x}}{y_{x+\Delta x}}.\ \frac{y_{x+\Delta x}}{y_x} - 2\frac{y_{x+\Delta x}}{y_x} + 1\right),$$

$$\frac{1}{\Delta x^2}\left(\frac{npq - p(t+1)}{npq + q(t+1) + q}\ \frac{npq - pt}{npq + qt + q} - 2\frac{npq - pt}{npq + qt + q} + 1\right).$$

And so on. Substituting the values of $\frac{\Delta y}{dx}$, $\frac{\Delta^2 y}{\Delta x^2}$ and $\frac{\Delta^3 y}{\Delta x^3}$ thus found in the expression for R, and still supposing that n, t and *unity* form a descending scale of magnitudes, we shall find that while the denominator of R retains magnitudes of the order n^3, in the numerator not only that order of magnitude, but also the next two, viz., n^2t and n^2 with nt^2, disappear. Omitting quantities for the extremities of the locus, beyond the central body, the type becomes inapplicable.

Proceeding from the simple case of the Binomial to the problem of extracting balls *without* replacement, we have now three magnitudes to deal with; n the number of balls originally in the urn (mixed as before in proportion $p : q$), r the number of balls extracted without replacement, and s the number of black balls obtained. On the analogy of the simpler case we begin by expressing the ratio y_{s+1}/y in terms of those quantities. From the formula which I have elsewhere given* for y_s it follows that

$$y_{s+1}/y_s = \frac{np - s}{nq - r + s + 1} \times \frac{r - s}{s + 1},\dagger$$

Proceeding as before we may take the point corresponding to $s = rp$ or some neighbouring point‡ as the origin of the curve that is to represent the frequency of s; say, $s = rp + \alpha + t$ (where α is either zero, or of the order unity).

Let us begin with the suppositions that n is a large number, that r is a substantial fraction (*e.g.*, $\frac{1}{10}$, or $\frac{1}{4}$) of n, that t is small with regard to r (say, of the order $1/\sqrt{r}$). Then for the expression which is to be equated to $\left(\frac{d}{dx}\log y\right)_{x + \frac{1}{2}}$, namely,

$$2\,(y_{t+1} - y_t)/(y_{t+1} + y_t)\Delta x,$$

we obtain, multiplying out and reducing after the analogy of the

of an order smaller than those retained we obtain for R, $\frac{1}{12}\,\frac{1}{\Delta x^3}\,\frac{t^3}{n^3p^3q^2}$. Now multiply both numerator and denominator by Δx^3 and, putting as before $t\Delta x = x$, $2npq = c^2$, you have $R = \frac{2}{3}\,\frac{x^3}{c^3}$; an expression which is of the order of unity (or less), provided that x is not of an order greater than c. While that condition holds good, the fundamental equation is correct as a second approximation up to (exclusive of) quantities of the order Δx^2. That is, provided that Δx is small; otherwise the whole approximation breaks down.

By parity of reasoning it may be shown with respect to the problem of extracting balls *without* replacement that the fundamental equation from which the Pearsonian Type is derived ceases to be correct at about the same distance from the Mean or mode as that at which the generalized law of error ceases to be correct; that beyond that stage the Type has only that kind of advantage over the generalized law which has been attributed to the Method of Translation in a former section. (*Ante*, Section III, pp. 70, 74.)

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* *Encyclopædia Britannica* (ed. 11). Article "Probability," p. 380.

† In the external case above suggested (*p.* 425) the *sign* of s in the *first* of these two fractions is changed.

‡ See note to p. 426 above.

simpler case, and dividing both numerator and denominator by n, an expression of the form

$$\frac{-(x + a\Delta x)}{b_0 + b_1 x\Delta x + x^2\Delta x^2}.$$[*]

Where a and b_1 are of the order unity, b_0 is of the order $C^2 (= 2rpq)$. By reasoning of parity with that before employed it may be shown that the proposed equation holds up to and inclusive of the term in the expansion affected with Δx; but not beyond. Thus the type as before presents the same degree of approximation as the method of translation.

Now let us relax the provisional assumptions; and first (*ceteris paribus*) suppose t to increase beyond the order $\sqrt{r}$; so that $x\Delta x$ ceases to be a small quantity relatively to b_0. Then as before the discrepancy between the two sides of the proposed equation will come into play; the differential equation for log y will cease to be true. The matter is not made any better when r becomes a smaller fraction of n; and it is made worse as n becomes a smaller number.

I am aware that this is a fine issue turning on delicate relations between finite differences and differential coefficients; as to which one may easily misinterpret others, or be oneself mistaken. Moreover it is probably a side issue; not bearing directly on the question whether the curve obtained from the proposed differential equation is proper to represent observations which are the outcome of interdependent causes. That representation might still be adequate, even though it could be made out that the said class of observations was not well represented by the process of extracting balls from an urn without replacement, and that the law of frequency pertaining to that process was not accurately given by the proposed formula. Because A is not very like B, and B is not very like C, it does not follow that A is unlike C. Only there is required for the relation between A and C some other evidence than the use of B as a middle term. Such other proof is offered by Professor Pearson in some of his later utterances.[†] Probably we ought to regard these more recent reasons as constituting the main foundation of the formula in question; the analogy of balls extracted from an urn forming merely a scaffolding, or at best a buttress, for the construction. This is a position which we can accept heartily. For indeed it is exactly our own position. The considerations adduced in favour of the Pearsonian formula for $\frac{d}{dx}\log y$ are equally applicable to our formula for ydx. We, too, have had our scaffolding—the conception of a real group such as the heights of adults actually *translated* by taking a *function* of each height, say the cube (considered as proportioned to the weight). Our scaffolding, too, has been criticized as if it constituted the main foundation of our construction.*

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[*] It is interesting to observe that the sign of x^2 is *negative* in the external case (above, 429) when the chance of extracting a black ball is *increased* by having extracted black balls by a sort of law of increasing returns. It follows that for sufficiently large values for x—if the formula be regarded as applicable to such values—the frequency curve is *convex* to the axis of x!

[†] See "Mathematical Contribution," XIV, *Drapers' Research Series*, p. 5, and *Biometrika*, IV, p. 210.

According to this view there is no essential difference in respect of rationale between the method of translation (in general and so far as it is not coincident with the generalized law of error) and the system of types with which it is here compared. Both constructions are explicable upon a principle (suggested by Professor Pearson himself †) that the parameter, *standard-deviation* or *modulus* or *fluctuation*, should no longer be treated as constant throughout, but as varying with the position of the abscissa; varying according to the simple law which is formed by substituting for the constant in question a rational quadratic function, say $b_0 + b_1x + b_2x^2$. We, considering the abscissa of the normal curve as equal to cx, substitute for the constant c a function of the form specified. Professor Pearson may be interpreted as substituting a similar function for the constant‡ $\frac{1}{2}c^2$ (or σ^2) which occurs in the expression for the tangent of the normal curve divided by the ordinate (the differential coefficient of the logarithm). His construction is as much as ours entitled to be characterized as a "translation." Both involve an arbitrary departure from the normal form by the substitution of a quadratic function of the variable for a constant. Both are merely empirical; unlike the law of error, not obtaining any support from *a priori* reasoning. Both are defensible only as useful fictions; affording a likely-looking figure continually sloping downward (on either side) from a unique mode and having by construction a fairly close agreement with the data.

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* *Cp.* Pearson *Biometrika* IV, p. 199, *et seq.*, referring perhaps more to Professor Kaptein than to the present writer. It may be remarked that even in our first versions of translation (in *J.R.S.S.* 1898–1900) it was by no means grounded entirely upon the existences of cases such as those instanced in the text. It was proposed "partly on account of its convenience and usefulness as well as on the ground that it is *the* appropriate formula sometimes, perhaps often" (*loc. cit.*) "sometimes *the* formula, and generally a very good formula" (*loc. cit.*). Even less stress has been laid on the scaffolding in more recent statements (*Cp. Congress Paper*, p. 2). Considering the not infrequent occurrence of cases in which translation is *the* formula (*J.R.S.S.*, Vol. LXI (1898), pp. 676-7), it is tenable that our scaffolding is just as much or as little serviceable for the purpose of a buttress as the apparatus which served to introduce Professor Pearson's formula.

† *Biometrika*, IV., p. 210.

‡ The constant which (or the half of which) I have proposed to distinguish as the *fluctuation*.

Altogether, on the ground of capacity to represent observations resulting from correlated causes there is nothing to choose between the two compared methods.

A. 4. The use of the types under consideration to determine the *range* of a phenomenon may be based either on a substructure such as that which is symbolized by the extraction of balls from an urn without replacement, or simply by the unsupported substitution of a quadratic function of the variable for a constant in the expression for the normal curve. Against the former defence it may be objected, *first*, that the substructure has itself no basis; *secondly*, that if it had it would afford support to the main portion of the structure rather than the wings, so to speak; *thirdly*, that since the support afforded, such as it is, becomes less and less as we move outwards from the main body towards the extremities, at the points which limit the range, the support afforded by the underlying hypothesis would be a minimum.* If the calculation of range is based simply on what may be called translation in the large or double sense above suggested, then one variety of translation is as good as another for the purpose of the calculation. Our "stops" and "breaks"† may equally be employed to determine the range. Only those determinations as to which the two methods are fairly well agreed would be significant. And no doubt it may be expected that, as I have elsewhere shown,‡ there will be a similarity between the two representations as to the general trend of the represented shape. But it would be chimerical to expect precision such as would enable one to predict, say, a maximum (or minimum) height beyond which the barometer could not rise (or fall).

A. 5. It cannot be gainsaid that the calculation of the required coefficients from the given moments is effected with particular ease in the Pearsonian system. It was a stroke of singular felicity to select the formula for which the coefficients are connected with the moments by simple equations. But the disadvantage under which our method of translation labours in this respect would be greatly reduced if, the method becoming fashionable, a table adapted to its use should be constructed. The table would be bordered underneath with successive values of our constant β and on the left with values of ϵ, and at the points or little squares corresponding to any assigned simultaneous values of β and ϵ there would be entered the corresponding values of χ and λ.

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* It follows from the relations between the differential coefficients and finite differences that the equation of $\frac{dy}{dx}\Big/y$ to the *slope* of the polygon divided by the mean ordinate becomes more and more inaccurate as we move outwards toward the extremities.

† *Ante*, p. 76 and references there given.

‡ *Report of the Fifth Congress of Mathematicians* (1912), p. 12 of the present writer's Paper on "A Method of Representing Statistics."

A. 6. The ideal beauty of the One in Many is certainly realized in a remarkable degree by the variety of the types which are comprehended in one fundamental differential equation. But we also can form species of translation characterized by the different signs or relative magnitudes of the coefficients in the translating operator. If we do not think it worth while to do so, it is only because the said differences are not so important in our system. They do not, as when they occur in the expression for the differential coefficient (of log y), correspond to discontinuous changes in the function representing y.* That is a difference not to our disadvantage.

B. I go on now to the considerations which are *prima facie* in favour of our system.

B. 1. I need not dwell again upon the peculiar prerogative of the law of error, normal or generalized.

> Quo nihil majus generatur ipso,
> Nec viget quicquam simile aut secundum

—we may truly say of this universal ubiquitously prevailing law. Or rather there is generated from it something similar and second to it, whenever the normal error-curve forms the generating curve from which there results by way of translation a subnormal curve practically coincident with the generalized law of error.† It seems a singular merit of our system that while its primary form is theoretically the best of all in a large and important class of cases, its second method is in those cases practically coincident with the first. But this second advantage is only *prima facie* an advantage over the rival system. For it is equally true of the Pearsonian types that with respect to subnormal cases they give a result which tends to be practically coincident with that of the generalized law of error.* If the reader finds some difficulty in proving this proposition, that very difficulty illustrates the further proposition that our system has an advantage in respect of simplicity.

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* As pointed out in the Congress Paper referred to in the last note (p. 14 of the Paper). As an illustration it may be noticed that in a case like that to which our Tables XXIV and XXV relate the Method of Translation jumps over the entangling distinctions which separate the Pearsonian Fifth and Sixth Types from each other and from the preceding Types.

† *Ante* (Section III), p. 73. The proof admits of being extended to some other small departures from the normal law; in particular the Pearsonian Types. Take, for example, Type III, the curve of which the equation referred to the Mode as origin is $y = y_0(1 + x/a)^{\gamma a}e^{-\gamma x}$ (Pearson, "Contributions," II; *Transactions of the Royal Society*, 1895, A, p. 373). For the fundamental differential equation we have now $\frac{1}{y}\frac{dy}{dx} = -\frac{\gamma x}{a+x}$: where $\gamma = 2\mu_2/\mu_3$; $a = \frac{2\mu_2^2}{\mu_3} - \frac{\mu_3}{2\mu_2}$ (*loc. cit.*). That is in our notation $\gamma = 1/cj$;

B. 2. Under the head of simplicity may be placed a certain advantage on which I might have dwelt under some of the preceding heads. Thus under the third of the A captions it has been shown that our method of translation is theoretically as capable of representing observations caused by interdependent agencies as the rival kind of "translation." It is now to be added that our translation has the advantage of simplicity. Not dealing with differential equations, it is more accessible to practitioners not conversant with the higher mathematics. A like advantage on our side is presented under the head of classification (A. 6). What the extent of this advantage is will depend no doubt upon the purpose aimed at; whether we should be content with a rough and ready representation of the phenomena, or the subject is such as to reward a large expenditure of mathematical skill and arithmetical labour.

Under the head of simplicity might also be placed some of the following advantages, though they have been thought worthy of separate notice here.

B. 3. Our system appears to have the advantage of simplicity in dealing with two-dimensioned statistics of the subnormal kind.

$a = \frac{1}{2}c/j - cj$. Substituting these values we have $\frac{1}{y}\frac{dy}{dx} = -\frac{2x}{c^2 + 2jcx - 2c^2j^2}$. Now suppose (1) that j is a small fraction, such that its second and higher powers (in comparison to the first) may be neglected, (2) that x (the distance from the mode) is of the same order as c, then the equation becomes approximately $\frac{1}{y}\frac{dy}{dx} = -\frac{2x}{c^2} + 4j\frac{x^2}{c^3}$; which is identical with the second approximation given by the generalized law of error. referred to the mode as origin. For, the mode being distant $-j$ from the Mean, the generalized law becomes now $y = e^{-x^2/c^2}\left(1 + \frac{4}{3}jx^3\right)$; $\log y = -x^2/c^2 + \frac{4}{3}jx^3$ (to the said degree of approximation); $\frac{d}{dx}\log y = -\frac{2x}{c^2} + 4jx^2$. A similar partial identification of other types with the generalized law of error with respect to subnormal frequency-groups is obtainable by parity of reasoning.

* See the last note.

For abnormal cases Dr. Isserlis' treatment,[*] elaborate though it be, is probably less laborious than the procedure which has been indicated in our fourth section.[†]

But the question has been raised whether it is worth expending very much labour to secure an adequate representation of a two- (or more-) dimensioned group.[‡] The considerations in favour of the negative answer would be strengthened if it could be shown that some of the advantages proposed by a laborious procedure are attainable by a rough and ready method, our simple as distinguished from "composite" translation. There is some reason to think that even in abnormal cases simple translation may afford a pretty good index of the correlation between two variates. A typical example studied in connection with previous references to the subject[§] may serve to point this suggestion.

Let us complete the above given returns for the Ages of Brides by tabulating the corresponding ages of bridegrooms; exhibiting the number of brides of each age who were married to bridegrooms of any one assigned age; and likewise distributing all the brides of each age among bridegrooms of different ages. Also for the sake of illustration, and without taking the trouble of manipulating the not very accessible Italian statistics from which the example was taken, let us assume that the distribution of the ages of bridegrooms generally is similar to that above found for a particular class of brides (except that the mean age is different). That the assumption is not too violent is suggested by Dr. Isserlis' example 2. In further accordance with his observations let us suppose that the correlation as determined by the product-sum, his ρ, our R, is about $\cdot 5$. Then to determine r, the coefficient of correlation for the generating normal curve, on the supposition of simple translation, we have the cubic equation[||] $\cdot 015r^3 + \cdot 1r^2 + 1\cdot 3225r = \cdot 5 \times 1\cdot 4375$ (the coefficients for the x curve being the same as before, and those for the y curve being assumed to be the same). Whence I find $r = \cdot 523$. Again suppose that R is only $\cdot 25$, *ceteris paribus*. Then the left side cubic equation for r remains the same, while the right side absolute term is halved. Accordingly the relevant root is $\cdot 267$. The proximity of r to R, notwithstanding the magnitude of the dislocating translation, is I think remarkable, and gives some countenance to the proposed use of simple translation for the purpose of an index.* The phenomenon of stability persists even when the abnormality is still greater, say when the coefficients of translation χ and λ, instead of being each $\cdot 1$, are each about $\cdot 15$, as they are in Dr. Isserlis' second example.† Taking R (his ρ) as (approximately) $\cdot 5$ we have now for r the cubic equation $\cdot 03375r^3 + \cdot 0225r^2 + 1\cdot 5006 \,.\,.\, r = \cdot 5 \times 1\cdot 684375$. From which I find $r = \cdot 55$ nearly.

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[*] *Philosophical Magazine*, Sept. 1914, Vol. XXVIII.

[†] *Ante* (Section IV), p. 287, par. 1.

[‡] *Ante*, p. 267.

[§] *Ante*, p. 282 *et seq.*

[||] *Ante* (Section IV), p. 275.

The rationale of this stability may be partly discerned by observing that even if we had constructed a more accurate representation of the surface by way of "composite" translation the additional constants would probably, as suggested by experience of the trials which have been made, have been of the same order as the κ and κ' obtained by the abridged method, and so the cubic equation for r would again not differ widely from the simple equation $r = \text{R}$. Thus if γ, the coefficient introduced by composite translation, were $\cdot 2$ for both curves, and κ the same, while λ was left out of account, then from the quadratic equation proper to this case‡ I find for the value of r (when $\text{R} = \cdot 5$) about $\cdot 45$. If $\gamma\ (= \gamma') = -\cdot 2$, *ceteris paribus*, $r = \cdot 58$.

B. 4. Under the head of simplicity may be placed yet another advantage with which our system should be credited—namely, the possibility of perfecting the calculation of coefficients by minimizing the Pearsonian index of misfit.§ It is true that this improving process may be applied to *any* coefficients not exclusively those of our system.|| Yet as the procedure was suggested by our method of translation used with percentiles, so it seems particularly appropriate to that method.

B. 5. Our system has also the advantage of simplicity in the construction of tables for the application of its formulæ. In the Pearsonian system, as I understand, a table which would enable one to pass at once from assigned values of the coefficients to the value of the ordinate y corresponding to any assigned value of the abscissa x, or to the area subtended by a finite tract of the abscissa

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* The index would, of course, give only a rough indication. We must not expect from simple translation, in a case where composite translation is required for the adequate representation of the surface, the fulfilment of the geometrical law proper to the translation of surfaces, namely, that a regression-line of the generating normal surface becomes in the translation the locus of points, each of which is the *Median* of an array.

† *Ante* (Section 1), p. 468.

‡ *Ante* (Section IV), p. 284.

§ Or rather a quantity which is an index of that index. See *J.R.S.S.*, Vol. LXXVII (1914), p. 850 note.

|| *Ante*, p. 500.

between, say, x_1 and x_2 would be a very complicated affair, extending over many pages. But nothing can be simpler than the table proper to interpret our formulæ when the constants χ and λ have been ascertained. A single simple table, the well-known and easily accessible table of the probability-integral, will suffice to determine the integral of the area comprised between assigned values for x_1 and x_2. To determine the ordinate at any point x—if it is not derivable with sufficient accuracy from the said table—there is required only an addition to the table such as that which has been made by Dr. Sheppard or Dr. Burgess.

B. 6. There remains one advantage on our side which cannot be included under any preceding head, a substantive asset, the only one against which, I think, there is no set-off. The capacity of translation by way of percentiles is applicable to data consisting of integral areas not admitting of moments being accurately ascertained.*

I leave it to the impartial statistician to strike the balance between these counterpoised considerations. I express no judgment except that careful weighing is required; that the scale on my side does not at once fly up and kick the beam. I submit, too, that the decision turns partly on the purpose to which the representation of statistics is directed. But one of the most difficult questions connected with our investigation is: What is its use?

* *J.R.S.S.*, Vol. LXXVIII (1914), p. 725; and *ante*, p. 483.

REVIEWS OF STATISTICAL AND ECONOMIC BOOKS.

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1.—*L'Alimentation de la France et les Ressources Coloniales ou Etrangères.* Par Daniel Bellet. 255 pp. 8vo. Paris: Felix Alcan. 1917. Price 3 fr. 50 cent.

The food of the people lies at the basis of every economic problem. Without sufficient food wealth is impossible, for labour is ineffective. To study the conditions under which an ample supply of nourishment, varied enough to meet the requirements of the body, and pleasant enough to make digestion easy, must, therefore, be the first preoccupation of the practical economist. The natural presumption is that no consideration should be allowed to interfere with this first necessity, and, consequently, the student of food economics naturally tends to be an opponent of all fiscal measures which, in the interests of certain sections of the community, fetter the free flow of all kinds of foodstuffs from the producing to the consuming districts of the world. M. Bellet's work is thus a plea for free trade in food. The essential argument of the protectionist is that the area with which he is concerned is or can be made capable of producing all the food required by the population, both in sufficient quantity and in sufficient variety. The reply of the free-trader is that everywhere there is under-consumption. Many volumes have been written on this subject, but the war has given us a crucial experiment on a large scale. Everywhere it has been necessary to increase the soldier's ration far above what he consumed as a civilian, in order that he may be able to endure the hardships and toil to which he is subjected, and the result has been that the rations of the remaining civilians have had to be severely reduced. A man not working requires as a maintenance ration food capable of producing 2,600 calories; the peace ration of the French soldier was 2,880 calories, and his ration at the front is 3,640 calories. It may be objected that it is not fair to treat an exceptional state of affairs as if it were normal, but the answer is plainly that the future of civilization will largely depend on the maintenance of something like this alleged extraordinary ration. Apart from the soldiers, all those engaged in the production of munitions and other military supplies have had to increase their rations in order to endure the strain of great and prolonged effort. But after the war the intensity of production will have to be continued in the work of repairing the ravages caused by the world-cataclysm, if we are not going to slip back into barbarism. More food will be an absolute necessity, and, furthermore, the soldier returning to civil life will not readily give up the larger and more varied ration to which he has been accustomed in the camp, and will be unwilling to restrict himself to the short commons of peace time. We may, consequently, expect a greater demand for food than ever before, and a widespread agitation for the demolition of all barriers that impede its supply.

Another lesson taught by the war was not sufficiently evident when M. Bellet wrote—namely, that it is highly dangerous to depend too much on foreign countries for essential foodstuffs. Especially is this true for cereals, which afford a far more economic means of satisfying human needs than meat. Either war must be prevented in the future, or the submarine must be eliminated, or every country must grow more food at home. The introduction of new systems, the alteration of existing methods of cultivation will, however, require time, while the need for food will be immediate and insistent, and obstacles to importation will be injurious to the community. A compromise between the interests of home-producers and consumers may be found in an arrangement, whereby the mass-product will come from abroad and the quality product be produced at home, as happens to-day in the United Kingdom with both cheese and meat. State help can be given to agriculture without tariffs.

M. Bellet surveys in successive chapters the situation in France as regards meat, fish, bread and cereals, eggs, poultry, milk, butter, cheese, fruit, sugar, and beverages. He is particularly concerned about meat, the production of which in France was estimated by "notre maître et ami Yves Guyot" to be in 1905 only one-half of what consumption required. In consequence of the war the situation will be worsened on account of captures by the enemy and the heavy draft on the cattle-herd to feed the Army, and it will take several years of reduced consumption of native beef before the number of cattle can be brought up to a safe level. Whatever may be the voting strength of the free-trade and the agrarian parties, necessity will compel for a pretty long period the continuance of the free importation of refrigerated meat which has been permitted during the war for Army supplies. M. Bellet surveys the cattle-rearing districts of the world to show that supplies are abundant, but his survey is superficial, and he shows a dangerously imperfect sense of the importance of time. It takes time to improve native herds, to build freezing works, to construct insulated ships, and until these three necessary conditions are fulfilled the herds of Brazil, Colombia, Central America, and West Africa will do little to increase the supplies of meat and bring down prices. We need not follow M. Bellet into the details of his remaining chapters. After all, his book is a piece of propaganda and not an encyclopædia, and the facts which he gives are usually up to date and calculated to arouse the interest of the student and induce him to investigate further. One point only we may refer to, both for its own importance and because it shows that our author has kept himself abreast of the times, and that is the importation into the United Kingdom of frozen salmon, halibut, soles, &c., from Canada, first for the Canadian troops and afterwards for British troops and civilians. Before the war the improvement of British fisheries was occupying the attention of the Government, and it is of great national importance from many points of view. After the war our statesmen will have many problems to occupy their minds, but someone must see to it that American fish do not do for the British fishing industry what American wheat did for British agriculture. H.W.M.

2.—*Principles of Commerce: a study of the mechanism, the advantages, and the transportation costs of foreign and domestic trade.* By Harry Gunnison Brown. xxiii + 154 + 188 + 207 pp., 8vo. New York: The Macmillan Company, 1916. Price 7*s.* 6*d.* net.

Mr. Brown is a professor of economics, and the present work is an academic treatise on the theory of trade. As indicated in the sub-title, the subject is treated in three sections, the first dealing with the mechanism of commerce and international exchange, the second with the economic advantages of trade between nations, and the last with the costs of transport and their influence on the development and course of trade. The ground traversed will be familiar to readers of cognate works by Goschen, Bastable, Clare, and writers on railway economics. The part on the "mechanism "of commerce" covers a brief statement of the laws of money, a description of the various methods of settling international indebtedness, and a discussion of the causes affecting the rate of exchange between different trading communities. In connection with the rate of exchange between New York and London, the author notes that since the outbreak of war the price of drafts on London has at times fallen below the specie point, full allowance being made for the high rate of insurance. There has, of course, been no open prohibition on the export of gold from the United Kingdom, but the author considers that there must have been some interference with this export, otherwise the rate of exchange could not have been persistently below the gold shipping point. The gold being in the United Kingdom, it is not easy to suggest any other explanation.

The section on the economic advantages of commerce is largely reproduced from the author's book on "International Trade," which was reviewed in this *Journal* in May, 1916. As there indicated, Mr. Brown's analysis leads him to support the Free Trade position. In the circumstances brought about, or revealed, by the present war, Free Trade, however, is being most strongly assailed, not by economic arguments, but by German submarines, and it would be well to have the case of Free Trade *versus* Protection carefully discussed with full regard to the situation so created.

The last section deals with the costs of transportation by rail and water, and the various factors determining the rates charged. The subject is considered mainly in its relation to trade, and, in conformity with his general attitude, the author deprecates the imposition of such charges on transport, whether by Government or the railway and shipping companies, as will divert trade "out "of its natural channels," *i.e.*, out of the more profitable, in the economic sense, into the less profitable channels.

The author hopes to catch the general reader as well as the student, and both will find the book a useful introduction to the subjects of which it treats, though it is in places a trifle heavy.

A. D. W.

3.—*American and foreign investment bonds.* By William L. Raymond. x + 324 pp., 8vo. Boston and New York: Houghton Mifflin Company, 1916. Price $3 net.

The author's aim in this book is to describe the leading classes of investment bonds, and discuss the important factors determining their "intrinsic value," by which appears to be meant the degree of safety offered by the different classes of bonds to investors. Bonds "represent, as a rule, a promise to pay a definite sum of money "at a given time, with, usually, a regular rate of interest." Not all bonds, however, fulfil both these conditions. Many Government bonds, for instance, are practically acknowledgments of indebtedness, with no promise to repay the principal at a fixed date. The classes of bonds considered by Mr. Raymond are: Government bonds (often called "stocks"); State bonds; county, municipal, and district bonds; railway bonds; bonds issued by public service companies or corporations, such as gas, water, electricity companies; and bonds of ordinary industrial and commercial undertakings.

In discussing the principles which should govern investment in these bonds, the author ranges over a wide field, and brings together a great deal of interesting and valuable, but also some rather scrappy, information. As example of the latter may be mentioned the outline of the histories of France, Germany, Italy, Austria-Hungary, Russia, and Japan, compressed within the space of five pages—an outline intended to help the reader to understand the modern status and credit of those nations! The chapter devoted to Government bonds appears to us, in fact, to be the least satisfactory in the book. An attempt is made to weigh up the principal nations (the great nations now at war) from the point of view of the security they offer to the investor in their national bonds, but we are left without a clear idea of the relative positions these nations occupy in this respect, except that the United States seems to be an easy first, while the economic or financial position of most of the rest (including Great Britain and Germany) is more or less "precarious." It is, of course, impossible, as the author states, to estimate closely the credit of the several nations after the war. If the war lasts for many more years, we might indeed see one or more of the belligerents repudiating their war debt, the less well-to-do classes of the community (the majority in the State) being unwilling to stand the burden of taxation necessary to meet the annual debt charges, feeling that they are "not getting their money's worth." Meanwhile, in spite of this risk, the patriotic citizen must back his Government financially for all he is worth.

The chapters on the remaining classes of bonds are based on conditions in the United States of America, and contain facts, historical and legal, as well as financial, which must be of considerable interest to intending investors.

It cannot be said that a person with capital will find in this book a guide to the best investments. Indeed, after reading it, such a person may be more doubtful than before as to the best way to dispose of his money. This only means, however, that he may be made more cautious and inquisitive in his choice of an investment, and that is all to the good. A. D. W.

4.—*Addresses and Papers on Insurance.* By Rufus M. Potts, Insurance Superintendent, State of Illinois. 489 pp., 8vo. Printed by authority of the State of Illinois, 1917.

Social Insurance: An Economic Analysis. By Robert Morse Woodbury, Ph.D., Assistant Professor of Economics in the University of Kansas, sometime President White Fellow in Political and Social Science in Cornell University. x + 171 pp., fcap. 8vo. [Cornell Studies in History and Political Science issued by the President White School, Cornell University, Vol. 4.] New York: Henry Holt and Company, 1917.

Both these works come before us as published by authority. The first consists of a number of discourses delivered and reports made by Superintendent Potts during his four years of office. The writer of the introduction to the book states that the administration of that office by Mr. Potts marked a distinctly progressive period in the history of insurance. The second is a thesis for the doctorate in Philosophy, which well deserves the honour of publication in the University series of studies.

Mr. Potts informs us that in 1914 the premiums collected in the State of Illinois alone were, for fire insurance 5,400,000*l.*, for life insurance 13,200,000*l.* and for all insurances 22,000,000*l.* In the whole United States, the collections were, fire 86,000,000*l.*, life 176,600,000*l.*, and for all insurances 297,000,000*l.*

Nearly three-fourths of his volume is occupied by official records relating to the subject of Fire Insurance. They commence with a judicial finding by him that what are called "underwriter's policies" were illegal in the state of Illinois. That is followed by an address, advocating the compulsory sprinkling of all business buildings and blocks in the congested districts of a city, and another showing that the insurance rates prevailing in Illinois are inequitable. This accusation is developed in a voluminous report, in which the Insurance Superintendent calls for radical legislative reform. He submitted at length for the 1917 session of the State legislature the text of a statute drawn up by him to secure that reform. His statistics "reveal the fact that Illinois citizens have paid the companies "approximately $2 in premiums for every $1 returned for fire losses, "uniformly for over twenty years." If, he urges, for any reason a system of State fire insurance cannot be immediately put in operation in Illinois, then the protection of the citizens demands that rates be controlled by the State. On December 30, 1916, he presented a supplemental report containing detailed statistics of premiums and losses experienced under every class of risk insured.

On the subject of life insurance, Mr. Potts criticized the system of assessment insurance, but gave it the credit of having for its object the worthy purpose of furnishing insurance to the people at as near actual insurance cost as operating expenses permit. He argued in favour of a law requiring a reasonable qualification for life assurance agents, and licensing those who could pass the tests prescribed. He considered that the trend of the times was not towards State insurance, but strongly towards proper State supervision and regulation of insurance. He advocated the advancement and extension of life insurance through educational channels. "The only bond "(he says) that has sufficient strength to withstand all stretching of "civilization is the great institution of insurance."

Other subjects that were touched upon by this eloquent and enthusiastic superintendent in the course of his official career are unemployment insurance, in respect of which he suggests that particular attention is required to avoid fraud and imposition and to prevent steady workers from being taxed to support the idle and thriftless; health insurance, the cost of which he considers to be excessive under existing systems; vital conservation and welfare insurance generally. On all these questions he had much to say and many shrewd counsels to offer, and the book is well worthy of study on both sides of the Atlantic. It evinces a higher estimate of the value of State action than we on this side usually entertain.

Dr. Woodbury's book deals with the same subjects, and he sums up his inquiry in favour of the provision by the State of compulsory insurance against sickness, accident, and superannuation as a definite step towards the elimination of poverty and the alleviation of the hardships of workers. It is interesting to find the like conclusion reached by two authorities, one from the official, and one from the economic point of view. Others have held that "compulsion "is antagonistic to American conceptions of personal freedom in "a democracy." (Dr. F. L. Hoffman, before the Economic Section of the American Association for the Advancement of Science, *Scientific Monthly*, iv, 397.) Dr. Woodbury, not unnaturally, bases his arguments mainly on German experience, which affords the most ample statistical material that is available: but we are sorry to see that he has given little attention to English methods. The list of authorities he has cited contains few references to English authors, and does not include the discussions of the question that have appeared in this *Journal.* Though our statistics are yet incomplete, their results are probably more in accord with what may be expected to arise in the United States than are those of the elaborate German system. E. B.

5.—*The Industrial Outlook.*—By various writers. Edited by H. Sanderson Furniss, M.A. 402 pp., 8vo. London: Chatto and Windus, 1917. Price 3*s.* 6*d.* net.

"Never to tire, never to grow cold: that is duty." Most capable brains in these days are overpressed with immediate and urgent problems, and the admitted "duty" of taking thought for the morrow is very naturally put off till a more convenient season. Although many have given desultory and apprehensive heed to the certainty of a gigantic task in the immediate after-war period, few have bent to what Mr. Graham Wallas has called the "toil of thought," in any sustained and constructive sense. But Amiel's utterance as to the essential nature of duty is vividly true here. To preserve, at mental cost, the true attitude of mind towards the future need, to rummage and clear away all impossible old furnishings, to cajole or, better, to convince reluctant middle age, to educate and stabilise the younger thought—these are the duty, daily, insistent, and perilous. It is not merely that those who promulgate must be active; at least as much importance attaches to the bent and equipment of the far more numerous receiving minds, that all good thought be readily discriminated and encouraged, and that every specious and ill-advised proposal, however heralded, fail immediately to obtain a following and to lay waste our disputant energies.

The formation of a good public opinion is an urgent national necessity, if the future is not to be chaos and dark night. But just as educationalists are divided because we are not quite certain what to educate for (not being in any way agreed as to what life itself is for) and just as eugenists have not put beyond doubt what qualities we ought to try to breed for, so it is idle to discuss the proper extent or character of the State's economic activity after the war, "until some clear idea has been obtained as to the kind of State it is desirable to create." In the preparation of the public mental "soil," in which the best selected seed of thought is to germinate and prosper, various agents will have their uses. Not least among them will be literature, such as is now being published, setting forth, on the framework of justified economic theory, and with valid statistical assistance, the actual *development* of the pre-war world, as we knew it, that has soon to be remade; showing the changes and needs resulting from war conditions; and indicating the probable lines of reconstruction and reinforcement. Various books will appeal to readers in differing stages of preparation. The volume now under consideration contains four hundred pages of serious matter that in the hands of some publishers might have assumed a much more pretentious form at a far higher price. But it is to be hoped that this book will not on that account suffer in the amount of attention it receives. It is exceedingly well adapted to furnish a large class of readers with clear ideas as to the growth and urgency of the need, and as to the ways in which it can, and cannot, be met. Its keynote, as the introduction points out, is the "control of industry," particularly in the examination of what is proper and what is feasible in relation to the claims and obligations of labour, and in the reconciliation of conflicting interests in production. It presupposes that war and its aims will not dominate the peace activities of the future, for otherwise, "the discussion of problems of industrial "reorganisation is little better than a waste of time," but at the same time it recognises that a large measure of State oversight must be directed not only to the regulation of the industrial problem, but also to the ultimate unity and power of the State in war. Most of the essays deal with the position of labour in industry, and the forms of business control. Mr. Daniels, of Manchester University, prepares the way by analysing the present-day business structure and setting out the development of its differentiated functions. He is not hopeful that the elements of the problem will be essentially different in future or easier to modify, but there may be an "increased "willingness to make experiments and a stronger determination to "give them a fair trial." His contribution takes a useful place in the collection, and is workmanlike without being particularly novel. Mr. Henry Clay treats of the status of the wage earner and his psychology in relation to wage changes, whether he is a unionist or not. He brings us to grips with some of the difficulties of "restoration" to the *status quo ante* in a strong and interesting manner—a piece of writing that carries conviction. Mr. J. R. Taylor, of Leeds University, tells the story, in brief, of British Trade Unionism, and of the happenings during the war in the world of trade unionism, and his chapter will be a godsend to the average newspaper reader who has had no opportunity of getting a consecutive and clear idea of events, and who, not having been supplied with the reasons for certain critical actions, sees nothing but inconsequence to the point of madness or anti-patriotism. Mr. Piercy and Mr. Pringle, both of London University, might appear to cover the same ground in treating of the control of industry. But the former deals with control by producers (including all the factors of production) and by consumers, whereas the latter pays particular regard to State control. Mr. Piercy, by shrewd survey of the possible lines of action open to the consumer and to the wage earner, eliminates, as inadequate to their proposed end, many of the solutions put forward by expert writers, and comes to the view that the agency of the State for the effective working out of any coherent principle is essential. He points out, with much force, that the war has proved how greatly our economic life is based on the habits of component individuals that present a semi-automatic resistance to deflection. The comparative failure of the campaign for war economy illustrates for the consumer; the difficulties attending the dilution of labour illustrates for the worker; while the high degree of persistence, in the middle of a great war, of profit-seeking motives among employers is instanced as an indication of the third type of mind. It is not an argument for despair of change, "but it shows that human nature "itself prevents reconstruction at short notice on first principles." Mr. Pringle's essay is a good piece of political philosophy on the practical side, and these two essays form a splendid introduction to these aspects of thought. Somewhat apart from the rest of the book are Mr. Ashby's chapter on Rural problems and the reconstruction of agriculture on really industrial and scientific principles, and Mr. T. E. Gregory's lucid essay on credit and banking in particular relation to the developments proved necessary by the test of war conditions. Mr. Pringle has a chapter on Taxation, which is necessarily tentative in its outlook. Taken as a whole, although a single writer would have given more co-ordination and avoided some overlapping and apparent conflict of view, the work is distinctly vigorous and informing, and as it is reasoned and moderate in tone, it must fill a useful place in the present need. All the chapters have well-chosen bibliographies for further study along the several lines, but the absence of an index is unfortunate. J. C. S.

6.—*Other New Publications.*[*]

Carver (*T. N.*). Selected Readings in Rural Economics. 974 pp. 8vo. Boston: Ginn and Co., 1916. Price 12*s.* 6*d.* net.

[This volume consists of selections from the writings of various authors on agricultural economics, which Dr. Carver has brought together for the convenience of students. It is not intended to take the place of any of the manuals now available on the general subject of rural economy, but is intended rather as a handbook to accompany these manuals and to amplify the student's information in the general field of rural economics. The subjects discussed are grouped under the following heads:—1. General Principles; 2. Agricultural History: (A) European; (B) American; 3. Land Tenure: (A) Ownership; (B) Tenancy; 4. Agricultural Labour; 5. The Farmer's Business; 6. Agrarian Movements in the U.S.; 7. Rural Organization and Marketing; 8. Agricultural Policy; and there is a fair index.]

Coletti (*Francesco*). Due massime forze d'Italia. L'uomo e l'acqua 78 pp., 8vo. Milano: Fratelli Treves, 1917. Price 1 lire.

[1. Esame nazionale di coscienza; 2. Le nostre energie idriche; 3. L'altra massima forza italiana: la popolazione; 4. Lo Stato e le energie nazionali; 5. Conclusione, che recollega un unitá quanto si é detto: tutto dipende da noi e conviene fortemente volere.]

Connolly (*James*). Labour in Ireland. Labour in Irish history. The re-conquest of Ireland. With an Introduction by Robert Lynd. xxxviii + 346 pp., 8vo. Dublin: Maunsel and Co., Ltd., 1917. Price 4*s.* net.

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[*] See also "Additions to the Library," page 463, *sqq.*

Crammond (*Edgar*). The British Shipping Industry. 67 pp., 8vo. London: Constable and Co., 1917. Price 1*s.* net.

[The author divides his book into three parts. The first, "British Shipping before the War," reviews the development of British shipping during the past twenty years, and the part it has played in the economic life of the Empire and of the world. The second part deals with the services which British shipping has rendered to the Empire and to our Allies during the war. The third part deals with the future of British shipping which, in view of the changed conditions caused by the war, will, the author considers, necessitate the intervention of the State for several years at least.]

Kitson (*Arthur*). Trade Fallacies. A Criticism of existing Methods and suggestions for a Reform towards National Prosperity. With a Preface by Francis Stopford. xi + 286 pp., 8vo. London: P. S. King and Son, Ltd., 1917. Price 5*s.* net.

[The articles forming this book appeared originally in "Land and Water," and have been revised and in some cases added to. The author is of opinion that the basis for bank credit should be the national credit, and that neither currency nor credit requires any metallic basis. Further, that gold is entirely unnecessary for our home trade, and that a complete reform of the present system of banking is necessary.]

Kleene (*G. A.*). Profit and Wages. A Study in the Distribution of Income. iv + 171 pp., 8vo. New York: Macmillan Co., 1916. Price 5*s.* 6*d.* net.

[Contents:—Chapters 1. Introduction: General Outline of Subject; 2. Bohm-Bawerk's Theory of Interest; 3. The Time-Preference Theory; 4. The Abstinence Theory; 5. The Productivity Theory of Interest; 6. The Essentials of a Theory of Profit and Interest; 7. The Theory of Wages. The Supply of Labor; 8. The Theory of Wages. The Demand for Labor; 9. Conclusion: General level of wages is determined by size of wages and the supply price of different quantities of Labor.]

Lenski (*R. A.*). The Russian Market and how to enter it. 25 pp., 8vo. London: Russo-British Trade Exchange, Ltd., 1917.

Mavor (*James*), Ph.D. Government Telephones. The Experience of Manitoba, Canada. viii + 176 pp., 8vo. Toronto: The Maclean Publishing Co., Toronto, 1917. Price $1 net.

[A critical inquiry into the telephone system of Manitoba, which has been owned and worked by the Provincial Government since 1908. In the author's opinion the entire history of the scheme affords evidence of the most positive character against Government ownership and that the proper function of Government is not the conduct of industries but their impartial inspection under laws adapted to the character and conditions of the community.]

Montgomerie (*John*). The Nation's Loss through the Exemption from Income Tax granted to Co-operative Societies trading under the Industrial and Provident Societies Act, 1893. 39 pp., 8vo. Glasgow: John Thomlinson, Ltd., 1917. Price 6*d.*

[The author suggests as a remedy that Parliament should repeal the Industrial and Provident Societies Acts, and bring industrial societies within the scope of the Companies Act, making provision for their registration under that Act.]

Peddie (*J. Taylor*). A National System of Economics. With a consideration of the Paris Economic Resolutions and of their Influence on Nationality. xxiv + 299 pp., 8vo. London: University of London Press, 1917. Price 5*s.* net.

Péret (*Raoul*). La Population, le Budget, la Fortune et la Dette publiques de la France, de ses Alliés et de ses ennemis avant la Guerre. Aperçus Statistiques. 39 pp., 8vo. Paris: Felix Alcan, 1917. Price 1 franc.

[A useful compilation of the statistics of the population and general financial condition of the countries engaged in the present war, as they were before its outbreak. The estimates, where available· of the wealth and national income of the countries concerned, are given in a form useful for reference and in considerable detail.]

Peyer (*E. C. de*). A Scheme for State Purchase of Breweries and Licensed Houses with Practical Examples. 14 pp., 8vo. London: Sir Isaac Pitman and Sons, Ltd., 1917. Price 6*d*.

Pommereuil (*R.*). La Guerre Economique, 1914-17. Législation et réglementation douanières. Guide pratique à l'usage des industries, des commerçants et des fonctionnaires. 351 pp., 8vo. Poitiers: P. Oudin, 1917. Price 5 frs. 50 c.

[A compilation for the use of traders and commercial men of the numerous orders that have been issued in regard to the prohibitions of exports to or imports from different countries owing to the war. Though the book deals especially with France, there is a chapter on foreign legislation in regard to these prohibitions]

Prothero (*Rowland E.*). English Farming. Past and Present. Second edition. xv + 504 pp., 8vo. London: Longmans, Green and Co., 1917. Price 7*s*. 6*d*. net.

[The first edition of this valuable book was reviewed at length in the *Journal* for December, 1913, and was exhausted last year. It had been intended to shorten the book and re-issue it in an abridged shape, but that being impossible at present, the book has been merely reprinted and the tables of wheat prices and agricultural statistics brought up to date.]

Radford (*George*). Agricultural Co-operation and Organisation. Second edition, revised. 153 pp., 8vo. London: Hodder and Stoughton, 1917. Price 3*s*. 6*d*. net.

[In this little book, the first edition of which was issued some years before the war, the author urges the need of scientific management and business organisation to obtain an adequate amount of produce out of the land. In the present edition the author has adapted the book to the new conditions now existing.]

Somerville (*William*). British Forestry. Past and Future. A Paper read before the Worshipful Company of Carpenters on April 4, 1917. 19 pp., 8vo. London: Oxford University Press, 1917. Price 6*d*. net.

[Defects in management of forests in United Kingdom due to want of knowledge. Government inquiries into forestry and suggested remedies. Normal annual output of timber in this country. Afforestation in relation to food supply. Government aid in this and other countries. Industries dependent on supplies of timber.]

Todd (*John A.*). The Mechanism of Exchange. A Handbook of Currency, Banking and Trade in Peace and in War. xiv + 255 pp., 8vo. London: Humphrey Milford, 1917. Price 5*s*. net.

[The author's endeavour is to meet the new interest aroused by the War in economics and especially in questions of currency, banking and trade, they being the first affected when war was declared. In preparing his book, he has attempted to carry out his ideas of how economics should be studied, namely, as a constant application of theories to actual conditions. The book is divided as follows:—Chapters 1. Introductory;

Todd (John A.). The Mechanism of Exchange—*Contd.*

2. The History of Exchange; 3. Markets; 4. The Functions of Money; 5. The Quantity Theory of Money; 6. The Qualities of Good Coinage; 7. Bimetallism; 8. Paper Money; 9. The Credit System; 10. The English Banking System; 11. The Rate of Exchange; 12. A Financial Crisis; 13. The Test of the Quantity Theory; 14. The Balance of Trade; 15. The Theory of International Trade and Statistical Appendix.]

Webster (Robert Grant). The Awakening of an Empire. xxv + 326 pp., 8vo. London: J. Murray, 1917. Price 6*s.* net.

[This work deals with the important questions which must be faced by the British Empire and the Allies generally after the war. It contains a survey of the resources, needs, and aspirations of the countries described, and advocates a reconstructive policy designed to remedy, in the author's opinion, the glaring defects in our present inadequate economic system, and to promote a well-balanced system of interchange of commodities within the Empire, and in co-operation with our Allies and friendly powers.]

Competition. A Study in Human Motive. Written for "The Collegium" by John Harvey, Malcolm Spencer, J. St. G. C. Heath, William Temple, and H. G. Wood. xviii + 232 pp., 8vo. London: Macmillan and Co., 1917. Price 3*s.* 6*d.* net.

["The Collegium" is a group of persons banded together for study of social problems in the light of Christian principles. This volume, which is the first of their publications, consists of some ten chapters dealing with the various phases of competition in relation to human life. Each chapter represents the opinion of the group and not of the individual writer, as is often the case in works of this kind. The keynote of the book is the necessity for a change of outlook in regard to political and economic reform.]

The Cotton Year Book and Diary, 1917. Twelfth year of issue. Compiled for "The Textile Mercury" by S. Ecroyd. lxx + 671 pp., 8vo. Manchester: Marsden and Co., 1917. Price 2*s.* 6*d.* net.

[The statistical tables in the present edition of this useful book have been brought up to date. The review of the cotton trade during the past year, which, considering the European situation, has been good, and the comments on the cotton crops in various parts of the world will be valued by those interested. The financial status of a number of Lancashire cotton mills and the question of increase of wages are also considered.]

England's Financial Supremacy. A Translation of "Die Englische Finanzvormacht: England's Falsche Rechnung: Deutschland und die Erbschaft der City" from the "Frankfurter Zeitung." With Introduction and Notes by the Translators. xv + 106 pp., 8vo. London: Macmillan and Co., 1917. Price 3*s.* net.

[The translators in their introduction state that these articles appeared in Germany in November, 1915, and were later published there in pamphlet form, and, though not impartial as claimed, are on the whole correct. The original intention was to issue the translation without comment, but as this might lead to misrepresentation some of the author's inaccuracies are dealt with in the translators' notes. As the writer of these articles is one of the ablest and best informed of German critics, it has been thought useful to translate them into English for those unable to read them in the original language.]

South Wales Coal Annual for 1917, comprising Steam, Bituminous, and Anthracite Coal, Coke, and Patent Fuel: Wages, Prices, Freights, Exports, Docks, Railways, Wagons, Pitwood, and General Statistics. Edited by Joseph Davies and C. P. Hailey. xviii + 420 pp., 8vo. Cardiff: Business Statistics Co., Ltd., 1917. Price 7*s*. 6*d*. net.

[The statistical tables as regards imports, exports, prices and freights of coal have been brought up to date. The book also contains useful data as regards wages paid in the coal mining industry.]

Tasmania. The Parliament of Tasmania. Report on General Election, March 25, 1916. With Statistics of Other Elections held in Tasmania from 1902 to 1916, also including results of Referendum upon closing hour of Licensed Premises for Sale of Liquor. 51 pp., fol. Hobart, 1916.

CURRENT NOTES.

The record of Imports and Exports in the twelve months ended May, 1917, summarised in the table given below, shows a continuation of the expansion in value of our foreign trade. When the extent to which prices have risen in the last year is taken into account, the movements in the values of Imports and Exports are rather suggestive of reduced volume of trade than of expansion, since Imports have increased in value by a trifle over 10 per cent., and Exports by about 15 per cent. as compared with a year ago. Exports of United Kingdom produce have, however, increased in value by over 20 per cent., and if re-exports be deducted from imports, the balance shows an increase over the corresponding figures of a year earlier of about 13 per cent. The greatest relative increase in imports is in the raw materials class, and in exports the increase in the class of manufactures is proportionately about the same.

Apart from the undisclosed imports for war purposes, the comparison of values of imports and exports is as follows :—

	Twelve months ending May, 1917.	Twelve months ending May, 1916.	Increase (+) or decrease (−).
Imports, value c.i.f.—	£'000.	£'000.	£'000.
I. Food, drink and tobacco	444,006,	400,599,	+ 43,407,
II. Raw materials and articles mainly unmanufactured	355,493,	289,538,	+ 65,955,
III. Articles wholly or mainly manufactured	172,461,	193,843,	− 21,382,
IV. Miscellaneous and unclassified (including parcel post)	4,163,	3,228,	+ 935,
Total merchandise	976,123,	887,208,	+ 88,915,
Exports of produce and manufactures of the United Kingdom, value f.o.b.—			
I. Food, drink and tobacco	25,523,	26,983,	− 1,460,
II. Raw materials and articles mainly unmanufactured	67,125,	56,372,	+ 10,753,
III. Articles wholly or mainly manufactured	406,998,	328,176,	+ 78,822,
IV. Miscellaneous and unclassified (including parcel post)	19,863,	17,260,	+ 2,603,
Exports of foreign and colonial merchandise, value f.o.b.—			
I. Food, drink and tobacco	15,577,	21,384,	− 5,807,
II. Raw materials and articles mainly unmanufactured	51,053,	56,377,	− 5,324,
III. Articles wholly or mainly manufactured	25,457,	24,246,	+ 1,211,
IV. Miscellaneous and unclassified	90,	81,	+ 9,
Total, British, foreign and colonial	611,686,	530,879,	+ 80,807,

Nearly all the principal industries were fully employed in April. Much overtime was worked and, apart from increased earnings from this source, changes in the rates of wages affecting nearly one and a-half million workpeople, and resulting in a net increase of nearly 300,000*l.* a week were reported as having taken effect during the month. The percentage of unemployed shown by the Trade Union returns at the end of April remained steady at the figure of 0·3, while the figure for Insured Trades under the National Insurance Act (1911) fell from 0·58 at the end of March to 0·57, and that for workpeople under the National Insurance (Part II, Munition Workers) Act (1916) fell from 0·81 to 0·74.

The employers' returns for the textile trades, for the week ending April 28, 1917, showed 4·5 per cent. fewer workpeople employed than in the corresponding week of 1916, while there was a rise of 8·5 per cent. in the wages paid. In all the trades covered by the returns there was a fall of 6 per cent. in the numbers employed and a rise of 7·5 per cent. in the wages paid.

No later information is available than that given in the last issue of the JOURNAL as regards unemployment in Germany.

The increase in retail food prices in the United Kingdom continued during April, the percentage increase over the prices of July, 1914, as shown by the Board of Trade index-numbers published in the *Labour Gazette*, rising from 94 at the beginning of April to 98 at the beginning of May. The most marked increases during the month were in the prices of potatoes (averaging 11 per cent.), margarine (5 per cent.), and tea (4 per cent.). The only net decrease recorded was in the price of butter, which declined by nearly 4 per cent. or 1*d.* per lb. on the average. The prices, on May 1, 1917, of sugar, fish, potatoes and cheese were considerably more than twice as high as in July, 1914, and those of flour and bread were at, roughly, double the pre-war level. Advances of about 70 to 80 per cent. were recorded for bacon, butter, eggs and tea, and of about 60 and 55 per cent. respectively for milk and margarine. With sugar and tea, part of the increase is due to additional taxation imposed since the beginning of the war.

As compared with a year ago, retail prices showed an average increase of 29 per cent. The prices of potatoes advanced about 65 per cent. over the twelve months, and those of cheese and eggs nearly 50 per cent. In the case of the other articles included in the returns, the increases ranged from about 20 to 30 per cent., except with tea and sugar, for which the advances were 13 per cent. and 8 per cent. respectively.

In the case of other items of expenditure the average advance has not been so great as with food. The increase from July, 1914, to May 1, 1917, in the cost of all the items ordinarily entering into working class family expenditure, including food, rent, clothing, fuel and light, &c., is estimated at about 70 per cent., taking the same quantities and descriptions of the various items at each date and eliminating advances arising from increased taxation.

No more recent information than that given in the March JOURNAL is available as regards the course of retail prices in Germany and Austria. For other countries information is available up to various dates and is summarised in the *Labour Gazette.* The rise in Canada, as compared with July, 1914, was estimated at 41 per cent. in February; in the United States at 30 per cent. for the same month. In Australia it amounted to 24·8 per cent., and in New Zealand to 27·0 per cent. in January last. In Italy the average increase up to January was 44·2 per cent., and for Denmark (Copenhagen) 58·1 per cent. up to February. In the case of Switzerland figures compiled by the Swiss League for Reducing the Cost of Living showed an increase of 48·3 per cent., as compared with June, 1914, on December 1, 1916. Later, but less detailed information gives a rise of 57·9 per cent. up to March 1.

Turning to wholesale prices, the *Statist* index-number rose from 169·0 (revised figure) for March, to 172·2 for April, and the *Economist* number from 240·9 for March to 244·5 for April. The increase as compared with July, 1914 is 109 per cent., as shown by the *Statist* figure, and 110 per cent. as shown by the *Economist* number. As compared with a year ago, both numbers show a rise of 28 per cent. The *Statist* group showing the greatest increase during the month was that for "sundries," the most noteworthy increases in price having occurred in olive oil (25·7 per cent.), linseed oil and linseed (14·8 per cent.), and palm oil (12·2 per cent.). Higher prices for potatoes, oats and flour were partly offset by reduced quotations for wheat, barley, maize and rice, and "vegetable foods" were therefore only 1·5 per cent. higher for the month.

A pamphlet has been issued by the Bureau of the United States Census, describing its programme of publications for the years 1916 to 1919, when work on the fourteenth decennial census will commence. This forms a remarkable record of recent and prospective progress, and shows to what an extent the Census Bureau, first organised on a permanent basis so recently as 1902, has become a central statistical department of the federal government, conducting inquiries and compiling statistics under a unified control, which, so far as they are prepared in this country at all, are produced by a number of different government offices acting without very much regard to the comparability of their products. Thus the decennial census report is concerned with population, agriculture, manufactures, and mining, subjects dealt with independently in this country by the General Register Office, Board of Agriculture and Fisheries, Board of Trade, and Home Office. But the activities of the Census Bureau are by no means confined to the work provided by the decennial census, elaborate though that is. The mere list of the additional reports published decennially, quinquennially, annually, and irregularly, is most impressive, and fully explains how the Director is enabled to maintain his organisation intact and fully occupied during the intercensal intervals, an obviously economical and desirable policy, which is also the aspiration, so far a vain one, of the English census office. Amongst many other reports briefly described in the pamphlet may be noticed first certain amplifications of the decennial census report. Additional tables are to be published dealing with the occupations of women, children, and foreigners; data obtained as the result of special detailed inquiry into the circumstances of each blind or deaf and dumb person enumerated have been published; and the results of the census inquiry as to the fecundity of married women are to be tabulated. This latter inquiry was made also at the census of 1900, and much of the work involved by its tabulation was carried out, at a very considerable expense, but the completion of the task was not sanctioned by Congress. It is interesting to find that notwithstanding the delay which has occurred, the inquiry of 1910 is not to share this sad fate.

Other decennial inquiries are conducted, quite independently of the census, and at dates which do not correspond with it, as to religious bodies, water transportation, and fisheries. The difference in date must, it may be supposed, to some extent lessen the value of these inquiries. The chief quinquennial inquiry is the Census of Manufactures, corresponding to the British Census of Production. This was first made, it is interesting to note, in the year 1810, and is now taken simultaneously with the population census, and midway between two censuses in addition. It involves the tabulation of reports from more than 280,000 establishments. The coincidence of alternate inquiries with the general census is an advantage lacking in our recently established procedure. Amongst the annual reports issued, perhaps the most important are those concerned with mortality, which relate to the registration area only. This now includes two-thirds of the total population. Starting with the year 1915, birth statistics are also to be published, the registration area in this case including 31 per cent. of the total population. Marriage and divorce statistics are also to be published in future at frequent intervals, if not annually. In fact, notwithstanding the difficulties involved by the federal system of government, a complete system of annual vital statistics for the United States may, in view of the rapidity of recent progress in that direction, be anticipated in the near future.

Reports on the general and on the financial statistics of all cities above a certain size, the results of special annual inquiries, also find a place in this most comprehensive system ; and a similar series of reports on the financial statistics of states has been commenced. Under the heading of general statistics the subjects of inquiry vary from year to year, those chosen for 1916 being museums, art galleries, and zoological collections ; general recreation, including music, entertainments, celebrations, baths, bathing beaches, athletics, and playgrounds ; and the highways, policing, lighting, and areas of parks.

The Bureau has also recently published the first life tables ever compiled by the United States Government, a special feature of which is formed by infant mortality tables giving data for each month of the first year of life. A special monograph on cancer has also been prepared, relating to the year 1914.

Taken all round the statement forms an impressive record of rapid and systematic statistical progress, the result of a definite statistical policy supported by liberal appropriations, to which the present position of government statistics in this country forms in many respects a melancholy contrast. Even in vital statistics, where the position was till recently so unsatisfactory, the lee-way is evidently being rapidly made up, and the advantage possessed by this country may in the not distant future become one merely of continuity of record.

The Carnegie United Kingdom Trust has recently issued a report in two volumes on the existing provision for promoting the physical welfare of mothers and young children. Scotland and Ireland are separately dealt with. The first volume, by Dr. E. W. Hope, Medical Officer of Health for Liverpool, covers very much the same ground as has recently been traversed by Sir Arthur Newsholme in his reports on Infant and Child Mortality and on Maternal Mortality. General observations on the existing state of affairs and on the organisation by means of which improvement is being sought are followed by a number of very attractively, not to say sumptuously produced diagrams, nearly all of them in illustration of the annual reports of the Registrar-General. In connection with one of these the erroneous statement is made that "by far the greater number of "infants who die below 12 months of age actually succumb during "the first month"; whereas in fact the proportion is about one-third. The charts are followed by an abstract of legislation bearing on the subject matter of the volume, and this in turn by a series of reports in standardised form by medical officers of health on the care of mothers and little children in their districts. These reports, which form the greater part of the volume, contain tables recapitulating some of the most important vital statistics of the districts for recent years as well as showing the amount of maternal and infant welfare work carried out. The treatment of the subject, as well as the subject itself, is very reminiscent of Sir Arthur Newsholme's reports. The serious investigator would probably find much more grist for his mill in the latter, which contain a larger and more varied assortment of facts, but as their author himself says in an introductory note appended to Dr. Hope's report, "the diagrams and photographs "will aid in popularising their subject, and the volumes will reach a "public which may not be attracted by the detailed information "given in official reports already issued on this subject." The second volume, by Janet Campbell, M.D., one of the medical officers of the Board of Education, deals with the history and present state of midwifery in this country, schools for mothers and welfare centres, crèches, nursery schools, and play centres. It is not less interesting than the first volume, but no attempt is made to treat any of these matters statistically.

By the death of Mr. Ernest Aves in April last, the Society has lost a member who interested himself greatly in its work, and whose loss is deeply deplored by its Fellows.

Mr. Aves was a resident for many years at Toynbee Hall, and it was fitting that the memorial service, which was held in the Church of St. Jude, Whitechapel, on the 1st May last, should take place in a neighbourhood where his labours had made him many lasting friendships.

STATISTICAL AND ECONOMIC ARTICLES IN RECENT PERIODICALS.

UNITED KINGDOM—

Accountants' Magazine—

April, 1917—The Metric System and Decimal Coinage. National Health Insurance.

May, 1917—Trade after the War.

Associated Accountants' Journal. May, 1917—Duplication of Income Tax within the Empire. Notes on Income Tax and Excess Profits Duty.

Bankers' Magazine—

April, 1917—The Great Crisis. xxxiii: An eventful Month. The Progress of Banking in Great Britain and Ireland during 1916. An Historical Comparison, A.D. 1814–1916: *White* (*Benjamin*). Bankers' Superannuation and Pension Funds.

May, 1917—The Great Crisis. xxxiv: Nearing the End. The Progress of Banking in Great Britain and Ireland during 1916. Canadian Banking in 1916. Mr. Kengo Mori (with portrait).

Eugenics Review. April, 1917—Galton Anniversary: Discussion on the Disabled Sailor and Soldier and the Future of our Race: *Darwin* (*Major*), *Harris* (*Percy*) and others. A Study in Delinquency: *Williams* (*J. Harold*). Birth Control and Eugenics: *Ellis* (*Havelock*). Mental Development of the South African Native: *Bryant* (*Rev. A. T.*).

Journal of the Institute of Bankers—

April, 1917—The Gilbart Lectures. 1917. Lectures ii and iii: On Cheques: *Paget* (*Sir John*).

May, 1917—Mr. Robert Benson on the "Quantity Theory of Money": *Sykes* (*Ernest*). The Gilbart Lectures. 1917. Lecture iv: On Cheques: *Paget* (*Sir John*).

Journal of Royal Meteorological Society. April, 1917—Presidential Address, Annual General Meeting, January, 1917: *Lyons* (*Major H. G.*). The Heat Balance of the Atmosphere: *Dines* (*W. H.*). Continentality and Temperature: *Brooks* (*C. E. P.*). Climatological Studies. German East Africa: *Lyons* (*Major H. G.*).

Journal of the Board of Agriculture—

March, 1917—Agriculture and the War. The Food Production Department. The Encouragement and Improvement of Light Horse-breeding, 1915–16.

April, 1917—Agricultural Reconstruction. Report on Humogen: *Russell* (*E. J.*). The Education of City Boys on the Land: *Findlay* (*Prof. J. J.*).

May, 1917—The Net Output from Agriculture and its Distribution: *Orwin* (*C. S.*). Some Problems in the Growth of Silage Crops: *Amos* (*Arthur*). The Manufacture of Cheese in Co-operative Dairies.

UNITED KINGDOM—*Contd.*

Public Health—

March, 1917—The Selective Action of Infant Mortality. The Passing of Small-Pox in Britain. To what is it due? *Millard* (*C. K.*). Some points in a Complete Scheme for Maternity and Child Welfare: *Joseph* (*G. W. N.*).

April, 1917—The Feeding of School Children: *Buchan* (*G. F.*). The Problem of the Illegitimate Child: *Barlow* (*T. W. N.*).

May, 1917—An Outbreak of Bubonic Plague in the City of Bristol: *Davies* (*D. S.*). Introduction to Discussion on Diphtheria, based on Report of an Epidemic at Marley Hill and Sunniside: *Smith* (*Andrew*). A Statistical Study of Diphtheria.

Ireland. Journal of Department of Agriculture. April, 1917—Shorthorn Herds in Ireland. 1917. Allotment Gardens in Belfast: *Oliver* (*G. H.*). Town Allotments and Productive Thrift: *Fletcher* (*G.*). A New Form of Food-Chart: The Inometer: *Johnson* (*T.*). Tobacco Growing in Ireland. 1916: *Keller* (*G. N.*). The Extension of Cheese-making in Ireland: *Wilson* (*A. Poole*). An Agricultural Policy. Organisation and Working of the Food Production Scheme.

INDIA—

The Wealth of India—

February, 1917—The Prohibition Movement in the U.S.A.: *Singh* (*Sr. Nihal*). Company *v.* State Management of Railways: *Bhimpure* (*B. L. Vajpayee*). Premium Bonds: *A Compiler.*

March, 1917—The Imperial Financial Statement: *The Editor.* Indian Finance and Exchange: *Meyer* (*Hon. Sir William*). Industrial Britain after the War: *Pigou* (*Prof. A. C.*).

Indian Journal of Economics. December, 1916—The Economics of a Deccan Village: *Mann* (*Dr. Harold*). Railway Policy in India: *Barker* (*D. A.*). Agricultural Banks in India—a Rejoinder: *Chatterjee* (*A. C.*). Division of Crops on the Threshing Floor: *Guleri* (*J.*). Defects of the Land Tenure System of the United Provinces: *Chatnagar* (*Brij Gopal*).

UNITED STATES—

American Economic Review. March, 1917—Theoretical Issues in the Single Tax: *Davenport* (*H. J.*). A Rule for testing Tax Valuations of Railroads: *Smith* (*Mark A.*). Six years of Postal Savings in the United States: *Kemmerer* (*E. W.*). The History of the Trade Dollar: *Garnett* (*Porter*).

American Journal of Sociology. March, 1917—The Social Cost of Southern Race Prejudice: *Howard* (*G. E.*). Class and Caste. ii: Gradation: *Ross* (*E. A.*). Ethics and Neo-Malthusianism: *Spalding* (*H. S.*). A Theory of Rural Attitudes: *Bernard* (*L. L.*). Psychological and Statistical Interpretations of Culture: *Wallis* (*W. D.*).

UNITED STATES—*Contd.*

Annals of American Academy of Political and Social Science—

March, 1917—Containing a series of articles by different authors on Modern Insurance Problems grouped under the following heads:—Part 1. Life Insurance; Part 2. Fire Insurance; Part 3. Accident and Health and Workmen's Compensation Insurance.

May, 1917—Containing a series of articles by different authors on Stabilizing Industrial Employment grouped under the following heads:—Part 1. Survey of Methods to be used in Reduction of Labor Turnover; Part 2. The Analysis of Turnover; Part 3. Reducing Turnover in certain Plants; Part 4. Physical Conditions as Factors in Reduction of Turnover; Part 5. Employés' Voice in Management.

Bankers' Magazine (New York)—

March, 1917—Canadian Banking and Commerce Review. International Banking and Finance.

April, 1917—Philadelphia, the World's Greatest Workshop.

Journal of Political Economy—

February, 1917—The Federal Farm-Loan Act: *Bulkley* (*R. J.*). Government Ownership *v.* Private Ownership of Railways in Canada: *Biggar* (*E. B.*). The Molders' Union and the Allied Metal Trades: *Stockton* (*F. T.*). Charles Booth, 1840–1916: *Abbott* (*Edith*).

March, 1917—Business Acceleration and the Law of Demand: A Technical Factor in Economic Cycles: *Clark* (*J. M.*). Some Problems of Logical Method in Political Economy: *Viner* (*J.*). The Social and Economic Background of Woodrow Wilson: *Dodd* (*W. E.*). The Proposal of the Carnegie Foundation for Teachers' Insurance: *Ruggles* (*C. O.*).

May, 1917—The Philippine National Bank: *Willis* (*H. Parker*). The State Life Fund of Wisconsin: *Smith* (*Mark A.*). The Ethics of Land-Value Taxation: *Brown* (*Harry G.*). South America and the War: *Tower* (*Walter S.*).

Quarterly Journal of Economics. *May*, 1917—Financing the War: *Bullock* (*Charles J.*). International Trade under Depreciated Paper. A Contribution to Theory: *Taussig* (*F. W.*). The Regulation of Wages in New Zealand: *Hammond* (*M. B.*). The Literacy Test and its Making: *Fairchild* (*H. P.*). Coöperation among the Mormons: *Gardner* (*H.*). Flax: The Fiber and Seed. A Study in Agricultural contrasts: *Barker* (*W. S.*).

Quarterly Publications of American Statistical Association. *March*, 1917—Do the Statistics of the Concentration of Wealth in the United States mean what they are commonly assumed to mean? *Young* (*Allyn A.*). Desirable Additions to Statistical Data on Wealth and Income: *King* (*W. I.*). The Classification of Mental Diseases in New York State: *Pollock* (*Horatio M.*). The increasing Mortality after age Forty-Five—some causes and explanations: *Dublin* (*Louis I.*). On the Correlation between the Vote for Suffrage and the Vote on the Liquor Question. A Preliminary Study: *Gehlke* (*C. E.*). The Present Status of

UNITED STATES—*Contd.*

Quarterly Publications of American Statistical Association—Contd. Birth Registration in American Cities and its Relation to the Infant Mortality Rate: *Dublin* (*Louis I.*). Proceedings of the Seventy-eighth Annual Meeting of the American Statistical Association, Columbus, Ohio, December 27–29, 1916.

EGYPT—

L'Égypte Contemporaine—

March, 1917—La guerre et les contrats privés: *Castro* (*L.*). La Belgique en exil; comment elle vit, comment elle combat, comment elle souffre, comment elle espère: *Bosch* (*F. van den*).

April, 1917—The Census of Egypt: *Craig* (*J. I.*). La législation de guerre et Italie: *Casselli* (*E. Piola*). Note sur la fabrication du papier en Égypte: *Cattaui Pacha* (*J. A.*).

FRANCE—

Bulletin de la Statistique Générale de la France. January, 1917—Enquête sur les prix de vente au détail des denrées dans les villes. Statistique du conseil des prises pendant la seconde année de la guerre. Enquête sur les conditions de la vie ouvrière et rurale en France en 1913–14. (2^e^ partie Dépenses): *Dugé de Bernonville* (*L.*).

Bulletin de Statistique et de Législation Comparée—

February, 1917—Opérations de la Banque de France pendant l'année 1916. Les produits de l'enregistrement, des domaines et du timbre constatés et recouvrés en France pendant 1913. La production des vins et des cidres en 1916: *Allemagne* (*Prusse*). (1) Loi relative à l'augmentation des taxes additionnelles à l'impôt sur le revenu et à l'impôt complémentaire. (2) Le projet de budget pour 1917–18.

March, 1917—L'exploitation du monopole des tabacs en 1913: *Allemagne* (*Prusse*). La reconstitution des localités détruites par les événements de guerre en Prusse orientale: Ordonnance sur le remainement de certaines propriétés foncières dans la province de Prusse orientale: Italie. Exposé financier de M. Paolo Carcano, Ministre du Trésor.

Journal des Economistes—

March, 1917—La Politique économique britannique actuelle: *Guyot* (*Yves*). Sir Edouard Holden et la Situation générale financière: *Raffalovich* (*A.*). L'Industrie minière en France pendant les deux premières années de la guerre: *Pawlowski* (*A.*). L'Emprunt britannique: *Raffalovich* (*A.*). Le Commerce extérieur de la Suisse en 1915: *Jacq* (*F.*). Prévisions pour 1917. Cultures coloniales et capitaux français: *Chailley* (*J.*).

April, 1917—La Doctrine de l'Utile: *Guyot* (*Yves*). L'œuvre de Paul Leroy-Beaulieu: *Schelle* (*G.*). L'Industrie britannique après la guerre: *Bell* (*Sir Hugh*). Les Projets d'impôts en Allemagne: *Raffalovich.* Notre Marine marchande. Son passé, son avenir: *Lepeytre* (*Henry*). Notes économiques italiennes: *L. P.* La Préférence impériale et la "Free Trade Union": *Free Trade Union.* L'Impôt sur les bénéfices de guerre: *Dewarrin* (*Maurice*).

FRANCE—*Contd.*

Journal des Économistes—Contd.

May, 1917—La Formation politique des États-Unis : *Guyot* (*Yves*). Les Finances publiques en Grande-Bretagne : *Williams* (*W. M. J.*). Un Inventaire des ressources des colonies britanniques : *Raffalovich* (*A.*). Les Nouvelles Lois sur le crédit aux petites entreprises : *Dewavrin* (*M.*). La Reichsbank en 1916 : *Raffalovich* (*A.*). Problèmes et réalités russes : *A. R.* Les Chemins de fer français en 1916 : *Georges de Nouvion.* Le Péril de notre marine marchande : *Charles-Roux* (*J.*).

Journal de la Société de Statistique de Paris—

March, 1917—L'Allemagne de demain : *Chervin* (*A.*). Chronique des questions ouvrières et des assurances sur la vie : *Bellom* (*M.*).

April, 1917—L'Allemagne de demain : *Chervin* (*A.*). Revenus et budgets d'après-guerre : *Papin* (*R.*). Les mots usuels. Leur nombre et leur fréquence : *Estoup* (*J. B.*).

May, 1917—Données statistiques italiennes : *Bellet* (*Daniel*). Essai d'évaluation de la richesse de l'Espagne : *Barthe* (*André*).

La Réforme Sociale—

March, 1917—Comment reconstruire nos cités détruites : *Derraux* (*A.*). Le régionalisme et les familles nombreuses : *Brun* (*Charles*). Le mouvement économique et social. France : *Lepelletier* (*F.*).

April, 1917—Problèmes agricoles d'après-guerre : *Coquidé* (*E.*). Une nouvelle forme de la participation aux bénéfices. Les actions de travail : *Valleroux* (*H.*). Le Mouvement Économique et Social. Allemagne, Autriche-Hongrie : *Blondel* (*G.*).

May, 1917—Esprit scientifique et Sociologie : *Arendt* (*Ch.*). Le devoir social dans la profession : *Maroussem* (*Pierre du*). Le Mouvement Économique et Social. Pays anglo-saxons : *Rotours* (*Angot des*).

Revue des Nations Latines. *April*, 1917—Potasses d'Alsace, potasses d'Allemagne et d'ailleurs : *Bellet* (*Daniel*). La stratégie allemande et le réseau de navigation intérieure : *La Bolina* (*J.*).

ITALY—

Giornale degli Economisti e Rivista di Statistica—

March, 1917—La diversa pressione tributaria del prestito e dell'imposta : *Griziotti* (*B.*). Liberta di commercio interno e di lavoro negli economisti piemontesi nel secolo XVIII : *Rota* (*R.*). Dati sul costo dell'alimentazione.

April, 1917—Il mercato monetario e la guerra : *X.* Sull' evasione nelle trasmissioni gratuite mobiliari : *Contento* (*A.*). Dati sul costo dell'alimentazione.

ITALY—*Contd.*

La Riforma Sociale. March–April, 1917—Il sistema monetario del cambio aureo: *Loria* (*A.*). Alcuni appunti in materia di traslazione: *Ronchetti* (*dott F.*). Considerazioni sul cambio: *Donvito* (*G. Carano-*). Ancora sul limite dei prestiti bellici: *Pantaleoni* (*M.*). L'evoluzione nell'industria dei trasporti marittimi negli ultimi cent'anni: *Lorenzoni* (*G.*). La Russia e la sua politica commerciale dopo la guerra: *Kretschmann* (*J. G.*). Di alcuni sofismi sulle spese di guerra: *Graziani* (*A.*). Lavoro e ricchezza del dopo guerra: *Geisser* (*A.*). Quale sarà il prossimo andamento dei mercati? *Borgatta* (*G.*).

Rivista Italiana di Sociologia. January–February, 1917—Rivelazioni sociali della guerra: *Luzzatti* (*G.*). Le leggi della popolazione et il problema della pace: *Carli* (*F.*). La distribuzione dei caratteri fisici e mentali fra gli uomini: *Sermonti* (*A.*). Lo studio scientifico dei fenomeni finanziari: *Sensini* (*G.*).

DENMARK—

Nationalokonomisk Tidskrift. January–February, 1917—Ulykkesforsikringsloven af 6/7 1916: *Birkmose* (*Axel*). Taylor-systemet: *Bramsnaes* (*C. V.*).

SPAIN.

Revista Nacional de Economia. February–March, 1917—Politica ferroviaria y Economia nacional: *André* (*E. L.*). Fuentes económicas de la guerra: *Supino* (*C.*). El Monopolio de Explosivos: *Algarra* (*J.*). Consideraciones acera del empréstito. El Presupuesto de 1917 y la ley de Autorizaciones: *X. X. X.* La Economia politica en sus relaciones con la guerra: *Graell* (*Guillermo*). Los ferrocarriles en Chile: *Martner* (*Daniel*).

LIST OF ADDITIONS TO THE LIBRARY.

During the period that has elapsed since March, 1917, the Society has received the publications enumerated below.

Note.—Periodical publications are not included in this list, but they will be acknowledged at the end of the volume.

(a) Foreign Countries.

Denmark—

Communications Statistiques. 4me Serie. Tome 50. Statistique de la production industrielle 1913. (Recensement industriel 1914.) 8vo. 1917. (The Statistical Bureau.)

Bulletin of the War Study Society. August, 1916. Human Losses in the War. 38 pp., 4to. Copenhagen, 1916. (The Society.)

France—

Census. Resultats Statistiques du Recensement Général de la Population, 5 Mars 1911. Tome 1. 3^e Partie. Population Active. 183 pp., 4to. 1916. (Statistique Générale de France.)

Italy—

The War in Italy. Vol. 4. The Battle of Forizia. Vol. 5. On the Upper Isonzo; and Vol. 6. The Aeronautics. (Three volumes of photographs.) 4to. (Banca Commerciale Italiana.)

Sweden—

Cost of Living. Levnadskostnaderna i Sverige 1913-14. Del ii. Lokalmonografier 1. Västerås. 84 pp., 8vo. 1917. (K. Socialstyrelsen.)

Dairies. Mejerihantering ar 1914. viii + 43 pp., 8vo. 1917. (Bureau Central de Statistique.)

United States—

Census Bureau. Mortality Statistics. 1914. Fifteenth Annual Report. 714 pp., 4to. 1916. (The Bureau.)

—— Financial Statistics of States. 1915. 125 pp., 4to. 1916. (*Id.*)

Children. Tabular Statement of Infant Welfare Work by Public and Private Agencies in the United States. (Infant Mortality Series No. 5. Bureau Publication No. 16.) 114 pp., 8vo. 1916. (Children's Bureau.)

—— List of References on Child Labor. (Industrial Series No. 3. Bureau Publication No. 18.) 161 pp., 8vo. 1916. (*Id.*)

Labor. Bulletins of the Bureau of Labour Statistics. Whole Nos.:—

193. Dressmaking as a Trade for Women in Massachusetts. September, 1916. 180 pp., 8vo. 1916. (The Bureau.)

198. Collective Agreements in the Men's Clothing Industry. September, 1916. 186 pp., 8vo. 1916. (*Id.*)

Public Health. Vital Statistics. A Discussion of what they are and their use in Public Health Administration. By *John W. Trask.* 94 pp., 8vo. 1915. (The Public Health Service.)

—— A series of Pamphlets dealing with Notifiable Diseases, Morbidity, &c., reprinted from Public Health Reports. 22 copies. 8vo. 1913-17. (*Id.*)

New York (*State*). Special Bulletin. Department of Labor. No. 80. March, 1917. Fatal Accidents due to Falls in Building work, their Frequency, Causes and Prevention. 26 pp., 8vo. 1917. (The Bureau of Statistics.)

—— No. 81. March, 1917. Court Decisions on Workmen's Compensation Law. July 1, 1914-August 1, 1916. 406 pp., 8vo. 1917. (*Id.*)

Insurance Institute of America. Proceedings of Eighth Conference of Insurance Institute of America. Held at Cleveland, Ohio. October 17, 18, 19, 1916. 116 pp., 8vo. Boston. (The Institute.)

(b) India and Colonies.

India—

Madras. Gazetteer of the Cuddapah District. Vol. 1. 265 pp., 8vo. 1915. (India Office.)

United Provinces of Agra and Oudh. Six Vols. of District Gazetteers. Supplementary Notes and Statistics. 8vo. Allahabad, 1916. (*Id.*)

Australian Commonwealth—

South Australia. Friendly Societies. Seventh Report of Public Actuary relating to Friendly Societies in South Australia. Report for Quinquennial Period 1910-14, with Fifth Valuations of all Registered Societies as at December 31, 1914. 99 pp., fol. 1917. (The Public Actuary.)

Tasmania. Elections. Report on General Election, March 25, 1916. With Statistics of other Elections held in Tasmania from 1902 to 1916, also including results of Referendum upon closing hour of Licensed Premises for Sale of Liquor. 51 pp., fol. 1916. (Registrar-General and Government Statistician.)

(c) United Kingdom and its several Divisions.

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STATISTICAL ASPECTS OF INFLATION.

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[Read before the Royal Statistical Society, June 19, 1917, the President, Sir BERNARD MALLET, K.C.B., in the Chair.]

THE subject of this inquiry may be introduced by a reference to the Napoleonic war period. In that period also there was a great rise in prices and a prolonged controversy arose as to the causes. Tooke's great work on the *History of Prices* originated in the attempt to test by the appeal to facts the validity and relative importance of the causes assigned. The same causes are brought forward in our present war. We may begin by following Tooke's methods. By way of preliminary he gets rid of the popular notion that of itself war causes high prices. "On reference to former periods "of our history," he writes, "it will appear that there is no "observable coincidence of a rise of prices during war and a fall "during peace." He gives a table of war periods and peace periods and compares the prices. He deals with the objection common in his day that the war was so vast that any comparison with former wars was misleading. With regard to the currency and especially the notes of the Restriction period his first concern was to find out the facts—and in particular to find out the order of time in which they occurred. He showed that the volume of note issues was over-estimated and that the issues were not correlated to prices in order of time in the way supposed. His own conclusion was that the dominating influences were the course of the seasons and the obstructions to supply caused by the state of war. He attributes little weight to the currency. Tooke's guidance is valuable by way of suggestions and cautions. But it is *prima facie* probable that the causes noticed by him have operated in the present war in different ways and proportions.

It is never safe to apply the results of the historical method without special regard to changes of conditions. Tooke himself admitted that his own presentation of facts might lead others to different conclusions. The object of the present paper is to outline some of the statistical aspects of inflation. It is not meant to illustrate or prove preconceived theories.

In a paper elsewhere [1] I have examined the principal meanings of inflation, and especially the consequential distinction between general and specific depreciation. For the present purpose we may take inflation to mean an abnormal increase of the currency. What then is the normal from which an inflated currency deviates ?

The simplest and most natural answer is to take the average increase of the currency or different forms of currency over preceding periods, and compare the increase in the period of the supposed inflation.

From this point of view I have compared first of all the increases of the different forms of currency in the period of the war with such pre-war periods as may be supposed to give the normal increase.

Postal Orders.

I begin with a form of legal tender which as such was unrepresented before the war, namely, postal orders. By the Currency and Bank Notes Act (1914. 4 and 5 Geo. 5, Ch. 14) it was provided, Sec. 6, that for "the purpose of meeting immediate "exigencies all postal orders issued either before or after the passing "of this Act (August 6, 1914) shall temporarily be current and legal "tender in the United Kingdom in the same manner and to the "same extent and as fully as current coins, and shall be legal tender "in the United Kingdom for the payment of any amount." It is to be noted that the postal orders were not limited as legal tender like the silver or bronze but were like gold or Bank of England notes. This section of the Act was only revoked by proclamation dated February 3, 1915. The extent and nature of the issues of this new currency are given in the Mint Report for 1914 (published in 1916). During the fortnight ending August 20, postal orders over 13 millions in number of the value of 4·6 million £ were issued compared with 5 millions in number and 2 millions in value of the corresponding fortnight in 1913.

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[1] "Inflation of the Currency and the Rise in Prices," *Economic Journal*, December, 1916.

Early in September, however, it is stated that the number of currency notes in circulation allowed of a reduction of the number of the postal orders in the hands of the public.

So far then the postal orders may be considered as the beginnings of Treasury notes or the germ of the inflation.

By the end of October the value in the hands of the public did not exceed the normal amount, viz., 1,500,000*l.* though the number was considerably larger owing to the preponderance of orders of the lower denominations. This situation, it is explained, was due to the shortage of silver coin in some districts, particularly in Ireland and in military centres.

The Silver Coinage.

I take next the increase in the silver coinage. As the basis for comparison we must find the normal rate of increase before the war. A table is given in the Mint Report for 1914 of the issues of silver and the withdrawals in the United Kingdom from 1872–1914 (see Appendix). A glance at the final column of net issues shows very striking variations from year to year. Omitting 1914, on four occasions the net issues were above one million in value but in no less than ten separate years the withdrawals exceeded the new issues so that on balance there was a decrease. The average for the forty-two years (omitting 1914) was about 350,000*l.* The year 1909 showed a net loss, but for 1910–13 there was an average increase of nearly 875,000*l.* per annum.

The Deputy-Master of the Mint has kindly given me the figures for the period of the war in quarterly returns (see tables appended). The net issues for the five months of war in 1914 were 5,327,899*l.* This compares with 318,000*l.* of the first seven months before the war, that is about seventeen times as great. The monthly increase for the five months is about thirty-five times the normal monthly increase of the forty-two years, and fourteen times the monthly average of the four preceding years (1910–13) of very high issues.

The net increase in silver in 1915 and in 1916 was in each year about eight times the annual average of the four pre-war years.

Bronze.

It might be supposed that bronze being small change for silver there would be a very close conformity between their net issues. On the contrary there are some remarkable divergences.

From 1901–09, for example, there was in bronze a net increase of over one million in value whilst in silver there was a net decrease of about 300,000*l*. for the nine years. In 1910–11, the issues of bronze were below the average of the period 1900–13 whilst the issues of silver were more than double of the average.

In bronze the annual average of issues 1900–13 (Mint Report for 1914) was 173,947*l*. Allowing for Colonies, &c., and withdrawals the annual average may be put roughly as 150,000*l*. The annual average for the two years before the war was more than double of the average for the period, and in this case coincided with a corresponding increase in silver.

The period of the war shows the same absence of precise conformity of bronze with silver. The issues of bronze from August to December, 1914 (132,000*l*.), did not exceed the average of 1912–13. In silver, on the other hand, as already shown, there was an enormous increase.

The increase in bronze in 1915 was again below that of 1912–13, whilst the issues of silver were far above. In 1916, however, bronze rapidly increased to 450,000*l*., and for the period of the war to the end of March, 1917, the net increase was 951,689*l*.

Gold.

In the Report of the Committee of the British Association on Credit and Currency (1916) an estimate is given, founded on Mint Returns, of the pre-war amount of gold[2] in the United Kingdom. The estimated amount June 30, 1914, was 161·1 million £, of which 82·8 million £ were held by the banks and 78·3 million £ by the public.[3]

According to this estimate the gold coin in the United Kingdom increased from 100 million £ in 1903 to 113 million £ in 1910, or less than 2 million £ per annum. From December 31, 1910, to June 30, 1914, the estimated increase was 48·1 million £ or just under 14 million £ per annum.

From figures given in the Mint Report for 1914 (p. 10) it appears that for the year ending June 30, 1914, the net increase of gold coin for the United Kingdom after allowing for withdrawals and export (but not for other sources of wastage) was 15·3 million £. It is noticeable that the returns of the gold[2] held by the United Kingdom banks on the same date were the largest on record, being 82·7 million £, *i.e.*, 13 million £ above 1913 and 37 million £ above 1910. The issues by the Mint during the six years ending June 30, 1914, were

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[2] The Mint Returns refer to Imperial gold coin. The Bank of England especially held bullion and foreign coin.

[3] Jevons' *Money*, p. 165, gives the gold in circulation in 1873 as 100 million £, gold bullion in the Bank of England 15 million £, silver 15 million £ and bronze 1⅓ million £.

146·5 million £ and the withdrawals in the United Kingdom 17·1 million £. The balance of exports for the same period was 76·2 million £. The net amount taken abroad by travellers or lost was not known. This gives a net increase in the six years of about 9 million £ per annum. It will be seen that of the large increase from June 30, 1913, to June 30, 1914, namely, 15·3 million £, 13·3 million £ was taken by the banks, leaving only 2 million £ for the general public.

In the Circular dated December 31, 1914, of Messrs. Mocatta and Goldsmid (Mint Report, p. 89) it is stated that since the outbreak of war the Bank of England received the enormous addition of 64 million £ in bars and coin, considerable amounts being purchased and left in South Africa, Canada, and other parts of the Empire. The withdrawals for the same period were only 2 million £ in addition to 18½ million £ set aside for the redemption of the Treasury notes.

Treasury Notes.

In spite of this strong gold position one of the chief concerns of the Government in the first five months of the war was to issue currency notes for one pound and ten shillings ostensibly to take the place of the gold. The amounts of these issues are recorded week by week and the outstanding amounts give the quarterly increases. The general results are that at the end of December, 1914, the amount outstanding was 38·5 million £; in December, 1915, it was 103·1 million £; in December, 1916, 150 million £.

As in this case we start from a zero issue the five months' issues of 38·5 million £ are net additions at the rate of 91 million £ a year. The average for the years 1915–16 is 55 million £.

Other features in the growth of the currency notes are considered in later sections. Here as we are dealing with increase of currency we have to notice the effect of gold withdrawals. It is sometimes said that Treasury notes have simply displaced so much gold from circulation and so far cannot have caused any inflation of the currency.

If the gold had been definitely withdrawn or called in this contention would be valid. But, in fact, the Treasury notes were issued before there was any limitation of the gold in circulation. The gold was only gradually displaced from circulation and even as it was being displaced it still formed part of the monetary power of the country. It was not (to any appreciable extent) either hoarded or made into ornaments. It is possible that for a time larger amounts than usual were held by the banks, but with the very object of strengthening their monetary position.

Except then as regards the gold held against the Currency notes the new notes for internal purposes were, to begin with, exactly the same as an addition of so much gold.

Accordingly in estimating the increase of different forms of currency we ought to compare the Treasury notes with the gold formerly issued. The net amount issued the year before the war was fifteen millions which was a good deal above the average.

But in the first five months of the war to December, 1914, we have 38·5 million notes—less gold for redemption 18·5 million £—*i.e.*, a net addition of 20 million £ in five months. The additions to the outstanding amount by December, 1916, were 111·6 million £. The gold held against the notes was increased by 10 million £ to 28·5 million £, but this gold (it is said) was not originally displaced from the currency but obtained from abroad. The rate of increase of the notes 55 million £ per annum, 1915–16, as compared with gold is nearly six times the normal, 1908–14, and over 3½ times the highest year (1913) before the war—15·3 million £. If we deduct the additional 10 million £ of gold the rate of increase is 50 million £ per annum.

The increases in the note issues of the banks of the United Kingdom are for the present purpose of little importance as after a point they are normally in effect a kind of deposit receipt against gold, the authorized fiduciary issue being fixed. The new Treasury notes are supposed to take the place of gold for this purpose.

In July, 1915 (*Bankers Magazine,* August, 1915), compared with July, 1914, there was an increase in bank notes of the United Kingdom of 12·7 million £. Of this increase the Bank of England held 4·8 million £ against gold and the Scotch and Irish banks 7·8 million £ against gold and silver coin (the gold presumably being largely currency notes).[4]

Cheques.

In recent years people have become accustomed to speaking of the cheque as the principal form of our currency. In 1913, the aggregate London Bankers' Clearing House Returns were 16,400 million £. And these returns by no means include all the cheques in the kingdom. Still sixteen thousand millions of cheques is two hundred times the 78 million £ which was supposed to be the amount of gold in the hands of the public before the war.

Passing over for the present the question whether in considering inflation cheques are properly described as currency, it is interesting to notice that taking the Clearing House totals from August, 1914, to December, 1914, there was a *decrease* of 33·8 per cent. as compared with the same period in 1913. The total for 1915 was 13,407 million £ as against 16,400 million £ of 1913, a decrease of 22 per cent. The total for 1916 still shows a decrease of over 1,100 million £ compared with 1913. The first monthly increase is shown in November, 1916, and was followed by a decrease the next month. Even the first quarter in 1917 still shows a small decrease in the total clearings.

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[4] The later figures have not been extracted for the reason given in the preceding paragraph.

From these figures alone it would seem that in what is now called the most important form of our currency instead of an abnormal increase as in the other forms we have a remarkable decrease.

Even in normal times, however, as explained in the annual reports by Mr. R. Martin Holland, we must separate the different clearings. The Metropolitan country and provincial cheque clearings give a much better indication of the volume of the trade of the country as distinct from the finance which can be obtained from the town clearing. The various restrictions imposed on financial dealings in the war have intensified these differences. In the Report of 1915 it is said that the fall in the total is altogether financial as distinct from commercial and is due to the absence of Stock Exchange settlements, foreign loans, &c., and the reduction in the daily turnover of short money.

When we look to the country clearings alone we find the increase in the war period begins almost at once. The total country clearings for 1915 were 1,567 million £ compared with 1,389 million £ for 1913, an increase of 178 million £ or 13 per cent. The year 1916 showed an increase of 483 million £ over 1913, which was itself a record year. This is an increase of 35 per cent. as compared with 6 per cent., the highest increase for any previous year.

Here, then, we seem back again to the more common type of our war increases—the increase being more than five times the pre-war rate of increase.

With the same level of prices the increase in the country clearings may be said to measure roughly the increase in the volume of trade. If we take account of the fact that the index number (*Statist*) for 1913 was only 85 and had risen in 1916 to 136, it follows that there must have been some decrease in the volume of trade. A rise of prices of 60 per cent., if the volume of trade[5] had remained the same, would so far have raised the country clearing returns in the same proportion. The figure for 1913, namely, 1,389 million £, would have become 2,222 million £, but in fact it came only to 1,872 million £, an increase of 35 per cent. only.

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[5] Mr. Kitchin has made the following note: Volume of trade on *Statist* figures with 1913 = 100, for 1914 = 86½, 1915 = 86½, 1916 = 81.

Deposits.

Cheques are drawn against bank credits, and it is therefore more satisfactory in estimating any general inflation to go back to the funds on which the cheques are drawn.

The growth of bank deposits is given in the *Economist* banking numbers. In 1913 the aggregate was 1,104 million £ including 61 million £ for the Bank of England. In 1914 the aggregate had increased to 1,290 million £ (including the Bank of England), *i.e.*, by 186 million £. Before the war the increase in deposits for the last ten years had been on the average 30 million £ a year, so that in the first five months of the war the rate of increase was about six times the annual normal.

In 1915 the Bank of England showed an increase of only 5 million £ over 1914 and in 1916 the increase was only 9 million £, but the other banks gave increase of 118 and 201 million £ respectively. The increase in 1916 was like that of 1914—at about six times the annual normal rate. In two and a-half years of war there was an absolute increase of about 50 per cent. on the pre-war total.

General view of the abnormal increase of Currency.

Before proceeding to the abnormal rise in prices it will be convenient to summarize the results of the inquiry into the abnormal increase in currency.

The method adopted has been to compare the pre-war rates of increase with the rates of increase in the period of the war of the various forms of currency. In the case of new forms, *e.g.*, postal orders and currency notes, the comparison has been made with the forms of currency which they were intended to supplement or displace.

The increase in the rate of expansion has not been uniform. It might be supposed, *à priori*, that the different forms of currency being interchangeable according to the convenience of people there would be no serious alteration in the relative proportions, as there would be no important changes in the monetary habits of people. The shock to credit and the demand for the conversion of notes into gold only lasted a few days. People soon resumed their usual habits as regards the use, for example, of cheques, notes and coin. The new Treasury notes gradually took the place of gold without any disturbance.

It is also often supposed that if for any reason there is a general rise in prices there must be a corresponding and proportionate increase in the various forms of currency to do the money work at this higher level. At present we are not concerned with the causes of the change in the level or the nature of the connection between the money and the work to be done by it ; we are only considering the fact of the increase in general prices and the effects on the particular forms of currency.

I remember when I was giving evidence before the Gold and Silver Commission of 1888, Lord Herschell, the Chairman, expressed a doubt whether a rise in prices of necessity involved the use of more token currency. With a highly developed cheque system the doubt may be carried on even to standard money and the notes based on it. With a rise in prices cheques may be used for transactions which at a lower range required coin or notes. In this way less money so far would be required with a rise in prices. In his Budget speech Mr. Bonar Law called attention to the greatly increased revenue from the penny stamp on cheques. Again, with a twofold rise in prices it does not follow that double the amount of small change is required. I will leave the mathematical reasoning to Professor Edgeworth, but an example may serve for illustration. If a thing before the rise cost fifteen shillings, that could be paid for with half a sovereign and five shillings silver. After the rise to thirty shillings, three half-sovereigns (or ten shilling notes), would suffice.[6]

In the present war expansion of currency the increase has certainly not been uniform in every kind. For a considerable time the total amount of cheques actually decreased in aggregate value, and at the other end of the scale up to the end of 1915 the increase in bronze was below the increase in 1912–13, though it is true that by the end of 1916 bronze also had caught on to the general expansion.

Different forms of currency are adopted to different uses, and the amounts used will vary with any great change in these uses. The fall in the aggregate total of cheques is accounted for by the closure for a time of the StockExchange and the continued suppression of speculation in securities and in new companies. The tardiness in the expansion of bronze perhaps indicates that the very poorest, *e.g.*, the old-age pensioners, were the last to feel the rise in money incomes. Possibly the great increase in minute currency in the other belligerents may be due to the poverty of the people in view of the great rise in the cost of living. They need very small change to get very small amounts of consumable things.

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[6] I put the problem to Professor Whittaker and he brought it before the Edinburgh Mathematical Society. A paper was read by Dr. Lester R. Ford on *the Effect of a Rise in Prices upon the amount of Small Money used*, published in the Proceedings Vol. XXXV (Part 2), Session 1916–17. Two conclusions may be quoted. (1) "When the transactions involving small sums "are sufficiently predominating the amount of small money used varies with the "prices." (2) "The chief effect of an increase in prices on small money is the "greater use of the larger denominations of small coins." These results seem to be confirmed by the great increase of token coins with the rise in prices in the war and by the relative increase of silver as compared with bronze.

With these cautions in mind we may now attempt a general summary of the rates of increase. The rise in the rate of increase is greatest in silver. The issues have increased by more than 7 million £ a year, which is about twenty times the average of the forty-two years 1872–1913, and about eight times the average of the four years preceding the war. As will appear later on, this increase in silver is closely connected with the increase in wages and earnings.

The increase in cheques of a commercial character as shown in the country clearings is about fivefold the pre-war rate of increase.

In the bank deposits the increase has been about six times the normal rate.

In bronze the increase was below the pre-war rate up to 1916, but during that year rose to more than threefold the average. The aggregate clearings of cheques (for the reasons given above) only began to exceed the pre-war total at the end of 1916, so that in this case the normal rate of increase had not been kept up, but, in fact, had been turned into a considerable decrease.

The chief difficulty is as regards the Treasury notes, and the extent to which they have been substituted for gold. To estimate properly their share in the general progress of the inflation we ought to put the withdrawals of gold from time to time against the increases in the outstanding amounts of the notes. The manner, extent, and times of the withdrawals of the gold and the monetary uses of the gold withdrawn are not known. It appears, however, that the notes were issued much faster than the gold was withdrawn. As these notes were ostensibly intended to take the place of gold, the increase of issues should be properly compared with the pre-war increases of gold. At the end of 1916 the gold in the Bank of England had increased by about 18 million £ and there was also held 28½ million £ against the Treasury notes. If we deduct these amounts from the 82½ million £ held by the banks before the war and suppose that the remaining 36 million £ together with the 78 million £ in the hands of the public has been entirely displaced by the notes, the outstanding amount at the end of 1916, viz.—150 million £—is only 36 million £ above the pre-war amount of gold coins. This increase would be only about the same as the rate of increase in gold from December, 1910, to June, 1914.[7]

From another point of view, however, if we look to the increase in bank deposits of about 50 per cent. on the pre-war aggregate and suppose (as above) that notes have been substituted for nearly half the amount of gold formerly held by the banks, and that the banks have the power of increasing this paper reserve practically as much as they think fit, this aspect of inflation demands special consideration.

Bank of England notes have increased in circulation by about 10 million £, and Scotch notes by 16 million £, but these and other note issues under our system must keep either gold or currency notes against the excess over the authorized issues. Accordingly we cannot properly add these notes to the currency notes.

From the importance assigned to silver in the latter part of this paper it would be interesting to know the absolute amount before the war. I know of no official return. We know, however, that from 1872 to 1913 the total of new issues was 28·9 million £ and of withdrawals of worn coin of 14·1 million £. If we suppose that the withdrawals had practically got rid of the old silver the pre-war amount would be about 29*l.* The increase of nearly 21*l.* in the war would be about 70 per cent. It is quite possible, however, that the pre-war amount of silver owing to various wastages was much less than 29*l.* and the amount of silver may well have been doubled in the war.

The Abnormal Rise in Prices.

The index numbers of the *Economist* and *Statist* and the *Board of Trade* are so well known that for the present purpose a brief sketch of the general trend of prices as thereby shown will suffice.

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[7] How far the Currency notes have actually displaced gold either in active circulation or in the banks can only be conjectured. The point I wish to emphasise is that the displaced gold (except so far as hoarded by private people or melted or smuggled abroad) has still been a part of the monetary power of the country. In other words if the gold had not been displaced by the Currency notes the inflation must have been contracted by the drain on the banks. Mr. Kitchin has furnished the following comment: "According to a statement by "Mr. McKenna the best estimate the Mint was able to make for gold in the "hands of the public was 75 million £ at June 30, 1915. The figure seems "astonishing as gold had practically disappeared from circulation in London, "though in the North, I believe, clung to. The amount has presumably largely "fallen since. As the estimate for 1914 was 78 million £ the figures for 1915 "show that 46,600,000*l.* of Currency notes had only displaced 3,000,000*l.* of "gold. I distrust the official figures (for gold) and in any case the amount "must have largely ceased to be circulating and have become hoarded." A good many contributions were made in gold to the 1917 War Loan. Just before reading my paper I was told in an Edinburgh branch bank that 40*l.* had been paid in that day by a commercial traveller.

In the first six months of 1914 there had been a slight set-back to the rise in prices that was in progress more or less since 1896, though there was some recovery in July.

After the outbreak of war to the end of September there was a sharp rise of nearly ten in the *Economist* index number. In the last quarter, however, of 1914 the index number was practically stationary. The rise in food was more than counterbalanced by the fall in textiles and minerals.

By the end of 1915 a considerable rise had been effected in all the groups on the pre-war figures, the figures being 165·1 for December, 1915, compared with 127·3 for December, 1914. The rise continued in 1916 in every group—the figure for December, 1916 being 222. The latest *Economist* index number available for April, 1917, gives 244·5, as compared with 116·6 at the end of July, 1914, The *Statist* figures are 82·4 for July, 1914, and 168·4 for March, 1917.

The doubling of these index numbers in less than three years compared with previous records is altogether abnormal. The abnormality of the rise is perhaps best shown by the fact that the percentage rise in the war period has been more than twice as great as in the whole period 1896–1914. The *Statist* numbers, for example, are for 1896, 1914, and March, 1917, 61, 85, 168.

The advance in retail prices that enter into workmen's budgets are too well known to require any comment.

The difficulty, indeed, is to find any exception of importance to the universality in the rise in prices of commodities. Even in luxuries, in which a fall might have been anticipated, a rise has occurred—*e.g.*, in the sales of pictures. It was stated in connection with the restrictions on racing that blood-stock horses have greatly fallen in price. It is probable also that some forms of house property have also fallen, though this is partly due to the rise in the rate of interest—and movements in interest bearing securities of all kinds do not follow the same laws as prices of commodities.

The Abnormal Rise in Money Wages.

The *Labour Gazette* records the changes in the rates of money wages (including war bonuses) in important industries, and compared with pre-war periods there can be no doubt as to the abnormality of the rise. The net effect of all the changes in wages during the twenty-one years 1896–1916 is an increase of 2,000,000*l.* on the weekly rates. The greatest increases in any single year were 677,700*l.* in 1915, and 595,000*l.* in 1916. Previous to the war the greatest increases were 208,588*l.* in 1900 and 200,912*l.* in 1907. The total increase in the two years of war is nearly double the total increase for the nineteen years before the war.

A complete account cannot be given of all the changes in the rates of wages since the beginning of the war (as many of the unorganized employments escape observation), "but up to December, 1916, nearly 6 million workpeople had received some advance. The amount varied, but the average was about 6*s.* per head per week, and in some of the war industries 10*s.* to 12*s.*"[8]

These calculations take no account of increased earnings of overtime. We know also that there has been a great shifting upward of labour from stratum to stratum, and that many women and children have entered the ranks of the wage earners, and older men have re-enlisted. It would appear, then, that the rise in family earnings has been greater than in rates of wages. Account must also be taken of allowances to war dependents, which on balance have probably more than compensated the absence of the men. I will only add that taking the last figures available—April, 1917—the changes in the rates of wages affected over 1,470,000 people, and gave a net increase of 300,000*l.* per week. This is the largest monthly increase ever recorded.

How far this rise in money wages or in family earnings has been accompanied by a corresponding advance in real wages or earnings is, of course, quite another question.

The Abnormal Rise in Profits.

The abnormal rise in profits is made clear from the returns to the excess profits tax and the income tax.[9] There are certain difficulties in the calculations of the rise in profits—there are no returns[10] of any *Capital Gazette*—but there can be no doubt that the rise has been altogether abnormal. It has also been general—as shown by the profits of the great distributing firms.

It is clear that the abnormal rise in prices of commodities must be reflected in a rise in wages or profits, or both—the prices obtained from the products of labour and capital give their rewards.

As already shown, in the present war both have risen. It is generally found that in a period of rising prices the rise in wages lags behind the rise in profits. The recurring labour unrest is largely due to the belief of labour that such has been the case in the present rise of prices. The extension of Governmental control also points to the same result. The control is largely a remedy for the high profits.

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[8] *Labour Gazette*, p. 3, January, 1917.

[9] In 1914 Income and Property Tax (with Super Tax) yielded 47 million £, and in 1917 205 million £. Excess Profits Duty nil in 1914 in 1917 yielded 140 million £.

[10] The *Economist* publishes figures for the profits of trading companies, but points out that they are imperfectly represented, *e.g.*, as regards shipping.

Connection of the Abnormal Increase of Currency with the Abnormal Rise in Prices.

At first sight we are tempted to look simply to the final results, and to apply the quantity theory in the simplest form, and to say that obviously the increase in currency is the cause of the increase in prices.

The quantity theory, however, cannot be accepted in this simple form, even after allowing for rapidity of circulation. An alternative explanation of the relation between the two increases is that the rise in prices is due in the first place to obstruction of supply and intensification of demand, and that with rising prices more currency has been called for to do the monetary work. This order of events was illustrated by Tooke in important test cases, and admits of an adequate theoretical explanation. Prices may rise first of all through speculation, and it is only when the inflated prices have to be translated into money wages and other incomes that the real demand for more currency arises. If the country concerned has an effective metallic standard eventually the demand for gold checks the speculation. If, however, the effective reserve is paper, which can be increased indefinitely, the rise in prices so far may continue indefinitely. In this case, however, we may still say that the *causa causans* is the speculation.

There are, however, cases in which it is clear that the rise in prices is to be ascribed to the increase in currency and not the converse. Take, for example, the increase of silver in the sixteenth century and of gold in the nineteenth. Again, there are the great historical examples of the issues of inconvertible notes as in John Law's Bank and the assignats of the French Revolution.

In this connection it may well be argued that in the course of time our currency notes have become *de facto* inconvertible for internal purposes. Accordingly we should expect on this analogy that so far the prices would rise in response to the issues, and not the converse.

It often happens that the rise of prices begins with a rise in demand for important commodities, the rise being accelerated by speculation. Such a rise, however, cannot be maintained or advanced beyond certain limits unless there is an increase in the currency required for cash payments. In this sense, then, the continued rise in prices may be attributed to the inflation of the currency, although the excess of issues may follow the original rise in prices.

In the present case there was no doubt a sudden war demand for certain things. During the first five months, however, general prices did not rise much. There is no doubt also that in spite of the efforts of Government at control as soon as prices began to move speculation was stimulated. Through the excessive provision of emergency currency, followed by continued increases, no effective monetary restraints were imposed on the rise in prices.

It is also possible that a rise in prices may begin with an increase of currency, *e.g.*, inconvertible notes, and then at a later stage the rise in prices, aided by speculation, may call for more currency.

The limits of this paper do not admit of any discussion of these theories, which go back to the Napoleonic period. It is interesting to recall the fact that the late Sir Robert Giffen discussed the alternative connections of currency and prices in the old bimetallic controversy in a paper in the *Nineteenth Century* for November, 1889, in an article to which I made a reply in the next number.[11]

The proper test to apply in any particular case in considering the relations between the two increases is the order in time. This was the test applied by Tooke with such effect in the old controversy arising out of the Napoleonic bank restriction.

What we ought to do is to trace the growth month by month, or quarter by quarter of the two phenomena, and not merely to look at the final results as in comparing June, 1917, with July, 1914.

Unfortunately figures are not available for the quarterly increases of bank deposits. It is to be hoped they will be forthcoming after the war.

In the meantime, however, as explained in connection with cheques, it is sufficient to notice that the bank deposits are left in the air unless connected with cash in the form of coin or notes.

We may then apply the order in time test in the case of the Treasury notes and of silver—as gold is no longer an effective part of the circulation.

Treasury Notes and Prices.

Seeing that the Treasury notes have taken the place of gold internally they may be said to form the most important part of the legal tender currency. Fortunately also continuous records are given of the Treasury notes outstanding, and comparisons may be made with the monthly index numbers. By way of preliminary I took quarterly periods and compared the two sets of increases.

[11] My paper is reprinted in my *Money and Monetary Problems*, p. 381.

The object in view was simply to discover the general bearing of the connection, and not in any way to establish any proportion even if such a problem were soluble.

The general result of the first rough comparison is indicated in the tables of difference of index numbers and outstanding notes. (See Appendix.)

If we compare the *same* periods quarter by quarter there does not seem to be any connection. In the last quarter of 1914 the notes increased by over 10 millions (or 35 per cent. on the amount outstanding at the end of September), but the index number remained practically stationary. In the first quarter of 1915 the Treasury notes only increased by little over one million or less than 3 per cent., but the *Economist* index number rose 22·9. Again, in the quarter ending September, 1915, whilst the Treasury notes were increased by over 25 millions—a percentage rise in the quarter of over 50 per cent.—the *Economist* index number rose less than 4 per cent. The general result is that there seems to be no connection discoverable between the notes and prices, taking the same quarters.

If, however, the comparison is made of the note increases in one quarter with the index number increases in the following quarter then there is a remarkable correspondence.[12] For example, the large note increase in the December quarter, 1914, is followed by the large index number increase in the next quarter—March, 1915. The slight increases of notes in the next two quarters are followed by slight increases only in index numbers. The very large increase in notes in the September and December quarters of 1915 are followed by large increase in the next two quarters in index numbers.

For the remainder of the war period up to the present time the correspondence in quarters is not so striking, but the general trends of expansion are the same.

It must always be remembered that there are other currency influences that have to be taken account of, especially silver and bank deposits. There are also all the causes affecting commodities.[13]

With regard to bank deposits I regret that I have not been able to get quarterly periods. The comparison with the note issues and with prices would be of great interest.

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[12] In his Paper entitled "The Ratio Chart," in the *Publications of the American Statistical Association* for June, 1917, Professor Irving Fisher draws attention to a similar sequence in the United States.

[13] In the general quantity theory the volume of trade and transactions must always be taken account of. Disturbances in relative prices, owing to changes in demand and supply, indirectly affect general prices (as in index numbers). *Cf.* my *Money and Monetary Problems*—essay on *Causes of Movements in General Prices.*

Silver and Prices.

We are apt to be so overwhelmed with the magnitude of our cheque system and our gold resources that we are inclined to pay no attention whatever to the silver part of our currency. A little reflection, however, shows that when we follow out any market demand into its elements we are always brought back to the wants and the means of the individual consumers. But the great mass of the consumers of the great staples are the wage-earners, and a great part of their purchases are made with silver.

Although in dealing with silver and prices, as in the case of the other forms of currency, reference is made only to the quantity, it may be noted that especially under modern conditions silver has great rapidity of circulation. The nimble sixpence is more nimble than ever. A cheque is extinguished after one transaction but in the course of a year silver might very well change hands fifty times, and in that way an addition of twenty millions would be equal to a thousand millions used once.

For the period of the war Quarterly Mint Returns are fortunately available (see Appendix, p. 488). But before coming to the period of the war attention must be directed to the connection between silver and prices in the pre-war period.

The records of the net issues of silver from 1872 to 1914 and the very striking variations in the annual amounts have been referred to in a former section (p. 469, and for table of silver issues see Appendix, p. 489). I tried to find some correlation between the general movements of prices as indicated by the index numbers and the increases and decreases in silver.[14] From 1872 to 1896, there was a great and continuous fall in prices and thereafter a great and continuous rise. In a very general way if we look to the beginning and the end of the period we find a conformity. In 1872 silver issues were over a million £ (being more than three times the average of the 42 years) and again from 1910–13 the issues of silver were double the annual average. Between these two extremes the issues of silver on ten occasions showed a net decrease. But I could find no discoverable connection between the fluctuations from year to year or even in short periods of several years. Two examples may be given. The years 1874–5 were years of rapidly falling prices, but the net issues of silver were a good deal above the normal. Again from 1889–96 the fall in prices was most marked, and indeed 1896 is the minimum of the long depression from 1873. But the net issues of silver were very greatly above the normal. In fact 1889 is the year of the maximum net issue of silver over the whole period of forty-two years, and the average of the short period 1889–96 was more than double of the normal. Again though from 1897 to 1900 prices were rising and the silver net issues were a little above the normal there followed a period of nine years (1901–09) in which prices were rising and yet on balance the withdrawals of silver exceeded the new issues. From 1910–13 silver net issues were more than double the normal and prices rose. Over the whole period, however, the want of conformity is much more striking than the converse. From 1873–1910 the net issues of silver were much larger during the period of falling prices to 1896 than during the period of rising prices 1896–1910.

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[14] Mr. Kitchin notes: "Net silver issues showed maxima and minima with "prices, trade and other factors. Compare maxima (trade factors in brackets): "—1872 (1873), 1883 (1881–83), 1889 (1889–90), 1896 (no correspondence), "1900 (1900), 1906 (1906–07), 1912 (1912–13). But the curves nevertheless, "as you say, compare badly. They are better in trade than in prices."

But when I made the comparison of the silver issues with the movements in money wages the result was surprising.

Silver and Wages.

The comparison of the net issues of silver 1872–1913 with money wages, unlike the comparison with prices, shows a close conformity. With 1900 as the basis, of 100 wages rose 1871–75 from 77 to 86. The net issue of silver for 1872 was over 1 million £, and for the four years 1872–75 the average was 600,000*l.*, as compared with the yearly average for the whole period of forty-two years of 350,000*l.* From 1876–1880 wages fell from 86 to 82, and the withdrawals of silver exceeded the issues by 50,000*l.* per annum. From 1881–84 the net issues of silver were about the average, and wages rose slightly. In the next two years, 1885–86, the issues of silver fell below the average with a slight fall in wages. In 1887–91 there was a great increase in the issues of silver, being for the five years more than double of the average, 1889 being the maximum of the whole period. Wages (1887–91) rose from 83·1 to 91·6. From 1892–95 the net issues of silver fell as compared with the high level of the previous five years, but were still above the average. Wages fell slightly from 90·2 to 89·3. From 1896 to 1900 wages rose very much—from 90·2 to 100. The issues of silver were about the same as in the previous four years, *i.e.*, 24 per cent. above the average. There was, however, a great rise in wages—from 90·2 to 100. In this case the rise in silver was not so marked as in the other periods—probably owing to the exceptionally large issues of the nine years preceding. For the whole period 1887–1900 the net issues per annum of silver were

200,000*l.* above the average or about 57 per cent., and wages rose from 83·1 to 100.

From 1901–05 the issues of silver were a good deal below the withdrawals, and wages fell from 99 to 97·3. With increasing silver, 1906–08, wages again rose, but fell again in 1909 with a fall of silver to a net loss. From 1910–14 wages rose from 100·7 to 106·5, with very large issues of silver—more than double the average.

The comparison is made closer if the employment curve is combined with the money wages curve.[15]

The closeness of the conformity of increases in the net issues of silver with rises in money wages and earnings suggests a causal relation, which is found in the fact that wages are largely paid or expended in silver. Conversely, if we find large increases in silver we may expect to find rising wages or increased earnings. Of course, silver is used by other people as well as by the wage-earning classes, and wages are paid partly in gold (or under present war conditions in currency notes).

Coming now to the war period, in the first five months of the war, as already shown, there was an increase in the net issues of silver of over 5,200,000*l.* There were besides over 2 million £ of postal orders (above the normal) used as legal tender. There were also the 38½ million £ of Treasury notes which in that period had certainly not displaced gold. There was, in fact, a very large increase in the currency to provide for an emergency which had rapidly passed away.

In these first five months, however, there was no corresponding increase either in prices or in wages. Wages were on the whole practically stationary; and yet in the first quarter of 1915 a net issue of silver was again made of nearly 1½ million £—*i.e.*, more than the maximum of any single year in pre-war times.

The rise in wages began in February, and there was far more than enough of currency to support it. A fall took place in the net issues of silver in the next quarter ending June, but the million was again passed in the September quarter, and in the December quarter there was the enormous increase of over 4,000,000*l.* This unprecedented increase in silver was accompanied by an unprecedented increase in the rates of wages. The increase in family earnings must have been much greater. Over seven millions of new silver were issued in 1916 and the rise in earnings continued.

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[15] In making these and other comparisons I have been much indebted to the excellent set of curves by Mr. Joseph Kitchin, who has also kindly looked over the proofs and given the notes indicated.

Of course, I do not mean that the increase in silver of itself raised wages. The increase in silver was part of the general inflation which rendered possible the continued rise of wages. Notes are also used in the payment of wages and some kinds of wages follow prices.

The connection of wages and prices in order of time varies in different cases. At the beginning of the war the special war demand, backed by Governmental funds, raised some kinds of wages. Substitution and sympathy raised others. With the expenditure of the new earnings prices rose in response to the fresh demands. Then came the demand for war bonuses to meet the increased cost of living. The special war bonus was followed by the general sympathetic war bonus.

Such a rise in wages and in earnings was only possible with an increase of currency—silver and notes. If the restraints of peace time on the issues of currency had been in force a monetary crisis must have put an end to the rise.

Other evidence, *e.g.*, the relative stability of prices in the U.S.A., which can here be only alluded to, confirms the conclusion that the rise of prices in the United Kingdom is greatly due to the relaxation of the normal restraints on the issues of currency.

Whether this inflation was necessary or desirable either politically or economically involves another series of questions too large for this paper. There is, for example, the question of loans and taxes. As arising out of the present argument it is clear that loans, which are based on credit, before they can be effectively used or expended internally they must be pulverized into common currency. We were often told before the war that 90 per cent. of the value of coal was wages. The Census of Production has given us full evidence of the universal importance of the wages bill. The Government may pay its contractors by cheque, they again may pay their subcontractors and all the business people they employ also by cheque, but in the last resort somebody has to pay all the wages bills in cash.

Conclusion.

In conclusion, the broad results may be stated in the simplest form. There has been an abnormal growth in the various kinds of currency as compared with the pre-war rates of increase.

There has been also an abnormal rise in the prices of all the groups of commodities used for index numbers. The aggregate index numbers have doubled. There has been a similar abnormal rise in money-wages.

In order of time the abnormal increase of currency preceded the abnormal rise in prices and in wages. The period of incubation lasted about five months, and, at any rate for the first two years of the war, the rise in prices lagged behind the increase of currency.

The root cause of the inflation of the currency has no doubt been the great expansion of governmental credit, which has only been made effective by being pulverized into the varied forms of currency required for different purposes. The growth of bank deposits does not mean increased savings but increased credit advances. The necessary proportion of cash for wages and retail trade, &c., is provided by notes and silver.

It is not convenient in a statistical paper to point the moral as if it were a sermon. Perhaps, however, it may be said without prejudice or offence that even in war time the same causes are likely to produce the same effects. If the inflation of the currency continues, the rise of prices will also continue.

APPENDIX.

Table showing in quarters of years 1914–17 : I. *Currency notes outstanding ;* II. "*Economist*" *index numbers ;* III. "*Statist*" *index numbers ;* IV. *Differences in* "*Economist*" *numbers ;* V. *Differences in currency outstanding ;* VI. *Differences in* "*Statist*" *numbers ;* VII. *Mean of index numbers differences.*

Quarters of year.		I. Currency notes outstanding.	II. *Economist* index numbers.	III. *Statist* index numbers.	Differences.			
					IV. *Economist.*	V. Currency.	VI. *Statist.*	VII. Mean of *Statist* and *Economist.*
1914	I	....	118·0	83·4	....	....	....	....
	II	....	115·9	82·0	−2·1	....	−1·4	−1·8
Five months of war	III	28·4	126·4	88·1	10·5	28·1	+6·1	8·3
	IV	38·5	127·3	90·1	0·9	10·1	2·1	1·5
1915	I	39·8	150·2	100·3	22·9	1·3	10·2	16·6
	II	46·6	147·7	106·5	−2·5	6·8	6·2	1·9
	III	72·0	151·6	107·1	3·9	25·4	0·6	2·3
	IV	103·1	165·1	113·8	13·5	31·1	6·7	10·1
1916	I	106·7	182·4	127·0	17·3	3·6	13·2	15·3
	II	122·0	191·5	133·3	9·1	16·7	6·3	7·7
	III	131·5	201·0	133·1	9·5	9·5	−0·2	4·7
	IV	150·1	222·0	148·8	21·0	18·6	15·7	18·4
1917	I	144·6	240·9	168·4	18·9	−5·5	19·6	19·3

Net issues of Imperial silver coin in the United Kingdom during the war.

Period.	New silver issued.	Worn silver withdrawn.	Net issues.
	£	£	£
August and September, 1914	2,395,074	36,800	2,358,274
December quarter, 1914	2,996,950	27,325	2,969,625
March ,, 1915	1,536,913	40,000	1,496,913
June ,, ,, ...	312,075	27,332	284,743
September ,, ,, ...	1,125,200	37,000	1,088,200
December ,, ,, ...	4,240,910	14,145	4,226,765
March ,, 1916	2,394,841	13,000	2,381,841
June ,, ,, ...	2,190,050	30,000	2,160,050
September ,, ,, ...	1,538,800	31,400	1,507,400
December ,, ,, ...	1,302,600	39,795	1,262,805
March ,, 1917	1,199,407	29,900	1,169.507
Total	21,232,820	326,697	20,906,123

Net issues of Imperial bronze coin in the United Kingdom during the war.

Period.	New coin issued.	Worn coin withdrawn.	Net issues.
	£	£	£
August and September, 1914	42,510	1,073	41,437
December quarter, 1914	91,875	1,440	90,435
March ,, 1915	53,955	1,400	52,555
June ,, ,, ...	35,855	1,452	34,403
September ,, ,, ...	93,615	1,260	92,355
December ,, ,, ...	57,175	845	56,330
March ,, 1916	117,880	858	117,022
June ,, ,, ...	45,110	818	44,292
September ,, ,, ...	117,975	605	117,370
December ,, ,, ...	161,330	610	160,720
March ,, 1917	145,240	551	144,689
Total	962,520	10,912	951,608

New silver coin issued and worn silver coin withdrawn from circulation in the United Kingdom from 1872 *to* 1914 *and index numbers of money wages.*

Year.	New coin issued.*	Worn coin withdrawn.	Net issue.	Index numbers of money wages.	
				Board of Trade.	Mr. G. H. Wood's figures.
	£	£	£		
1871	....	....	....	....	77
1872	1,152,000	106,510	1,045,490	....	82
1873	734,500	168,263	566,237	....	87
1874	505,000	151,300	353,700	....	87

* Exclusive of Maundy money.

New silver coin issued and worn silver coin withdrawn—Contd.

Year.		New coin issued.	Worn coin withdrawn.	Net issue.	Index numbers of money wages.	
					Board of Trade.	Mr. G. H. Wood's figures.
		£	£	£		
1875	....	598,550	154,000	444,550	....	86
1876	....	107,300	275,000	− 167,700	....	84
1877	....	290,300	207,280	83,020	....	84
1878	....	412,700	398,135	14,565	....	83
1879	....	283,430	456,200	− 172,770	....	82
1880	....	386,200	399,390	− 13,190	83·1	82
1881	....	570,000	340,286	229,714	84·6	82
1882	....	157,900	44,750	113,150	85·8	82
1883	....	969,100	348,770	620,330	85·7	83
1884	....	506,900	183 000	323,900	85·0	84
1885	....	342,100	249,998	92,102	83·7	83
1886	....	294,000	151,000	143,000	83·0	83
1887	....	656,040	330,670	325,370	83·1	83
1888	....	490,425	226,000	264,425	84·9	84
1889	....	1,791,000	213,000	1,578,000	87·7	87
1890	....	1,330,000	269,700	1,060,300	90·5	91
1891	....	749,000	195,400	553,600	91·6	91
1892	....	737,750	217,525	520,225	90·2	91
1893	....	777,100	276,000	501,100	90·3	91
1894	....	707,400	374,145	333,255	89·6	91
1895	....	819,600	432,940	386,660	89·3	91
1896	....	868,000	209,903	658,097	90·2	91
1897	....	721,700	338,200	383,500	91·1	93
1898	....	716,700	346,097	370,603	93·4	94
1899	....	755,500	386,499	369,301	95·6	96
1900	....	918,600	325,700	592,900	100·0	100
1901	....	331,750	220,590	111,160	99·0	98
1902	....	248,115	390,195	− 142,080	97·8	....
1903	....	127,000	260,000	− 133,000	97·3	....
1904	....	193,300	630,388	− 437,088	96·8	....
1905	....	223,000	436,000	− 213,000	97·3	....
1906	....	805,200	623,016	182,084	98·7	...
1907	....	888,325	709,700	178,625	102·1	....
1908	....	422,880	261,613	126,267	101·5	....
1909	....	655,099	717,590	− 62,491	100·3	....
1910	....	1,119,951	529,839	589,752	100·7	....
1911	....	1,219,766	547,675	672,091	100·9	....
1912	....	1,750,828	496,890	1,253,938	103·4	....
1913	....	1,523,979	541,695	982,284	106·5†	....
1914	....	6,092,569	452,125	5,640,444	....	....
1915	....	....	....	....	....	....
1916	....	....	....	....	....	....
Total	....	34,950,097	14,592,677	20,357,420	....	....

			£
† 1915.	Net issue of silver	....	7,096,621
1916.	„ „	... .	7,312,096
1914.	Wages	....	107
1915.	„	....	117
1916.	„	....	137

107, 117, 137 } Estimated.‡

‡ Mr. Kitchin writes: "I estimate the Board of Trade Course of Wages (if still "published) would show 106·5, 107, 117, and 126 for 1913, 1914, 1915, and 1916."

RETURNS RELATING TO THE IMPERIAL BRONZE CURRENCY.

TABLE A.—*Issues of bronze coin to December* 31, 1914.

Denomination.	Bronze coin issued in 1914.	Bronze coin issued from December 17, 1860, to December 31, 1914.				
		1860 design.	1895 design.	1902 design.	1911 design.	Total.
	£	£	£	£	£	£
Pence	212,759	1,493,490	605,312	1,021,013	853,163	3,972,978
Halfpence	42,265	626,270	138,687	222,790	149,109	1,136,856
Farthings	6,110	127,953	33,810	45,429	23,743	230,935
Total	261,134	2,247,713	777,809	1,289,232	1,026,015	5,340,769

TABLE B.—*Imperial bronze coin issued annually from* 1900 *to* 1914 *inclusive.*

Year.	Bronze coin issued.				Distribution of bronze coin issued.		
	Pence.	Half-pence.	Far-things.	Total.	London.	Rest of the United Kingdom.	Colonies, Treasury Chests, &c.
	£	£	£	£	£	£	£
1900	133,385	28,930	5,980	168,295	37,350	118,740	12,205
1901	89,100	23,785	7,395	120,280	26,405	79,090	14,785
1902	114,317	27,767	6,315	148,399	28,784	108,675	10,940*
1903	85,480	24,155	4,260	113,895	14,365	83,175	16,355
1904	56,495	16,465	4,935	77,895	12,875	57,935	7,085
1905	76,920	19,285	4,120	100,325	15,450	79,360	5,515
1906	154,365	25,330	4,825	184,520	43,110	127,340	14,070
1907	188,885	34,070	4,595	227,550	55,185	145,050	27,315
1908	126,440	24,260	4,880	155,580	46,055	92,080	17,445
1909	88,567	25,964	7,280	121,811	30,869	71,532	19,410
1910	121,970	24,530	4,952	151,452	38,025	85,032	28,395
1911	107,750	26,755	5,800	140,305	28,680	106,710	4,915
1912	271,480	44,425	7,330	323,235	84,810	224,105	14,320
1913	272,925	36,630	4,970	314,525	92,475	213,875	8,175*
1914	212,759	42,265	6,110	261,134	68,314	188,920	3,900
Total	2,100,838	424,616	83,747	2,609,201	622,752	1,781,619	204,830
Annual average	140,056	28,308	5,583	173,947	41,517	118,775	13,655

* Exclusive of 100*l.* in one-third farthings issued to Malta.

TABLE C.—*Imperial worn bronze coin withdrawn from circulation.*

Year.	United Kingdom.			Colonies.			Total.		
	Pence.	Half-pence.	Total.	Pence.	Half-pence.	Total.	Pence.	Half-pence.	Total.
	£	£	£	£	£	£	£	£	£
1908....	4,471	789	5,260	160	40	200	4,631	829	5,460
1909....	17,483	2,792	20,275	505	95	600	17,988	2,887	20,875
1910....	18,697	2,477	21,174	883	376	1,259	19,580	2,853	22,433
1911....	17,151	2,534	19,685	408	392	800	17,559	2,926	20,485
1912....	13,096	2,118	15,214	398	94	492	13,494	2,212	15,706
1913....	11,877	1,816	13,693	77	13	90	11,954	1,829	13,783
1914....	8,277	1,391	9,668	151	44	195	8,428	1,435	9,863
Total	91,052	13,917	104,969	2,582	1,054	3,636	93,634	14,971	108,605

TABLE D.—*Wholesale prices, index numbers and currency note circulation.*

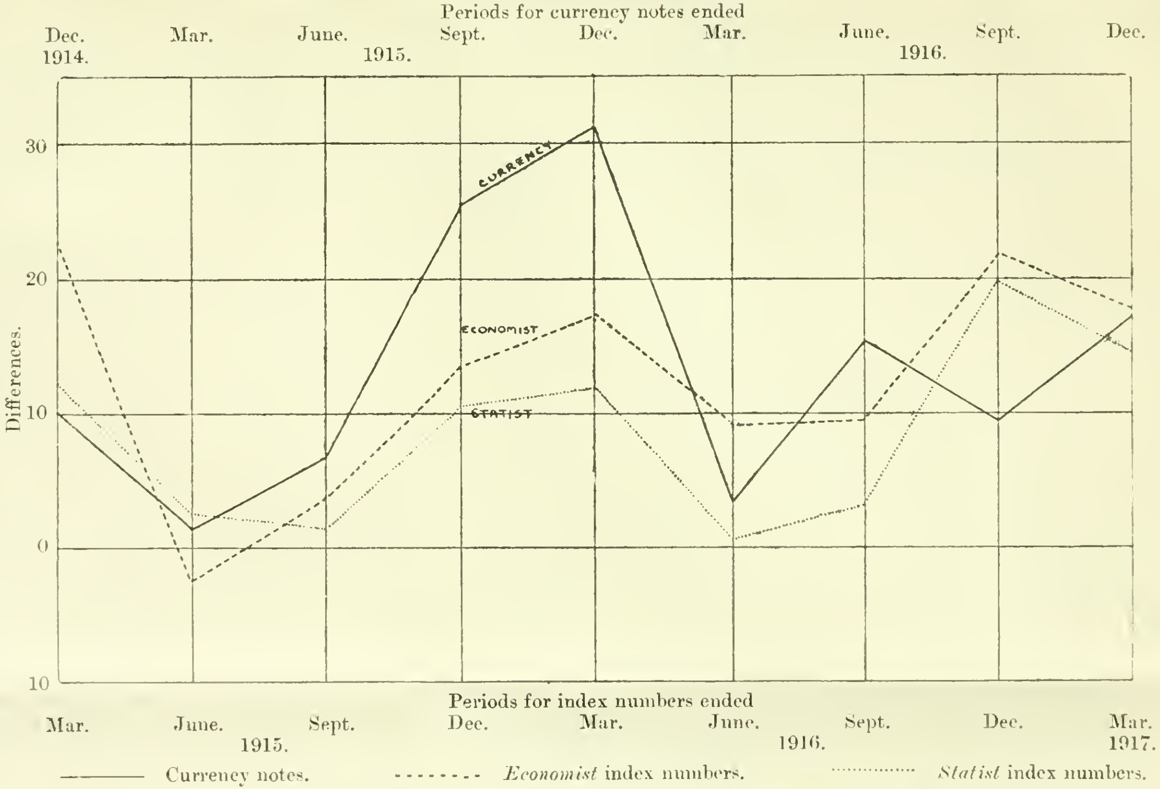
Dates.		*Economist* index numbers.			Quarterly average.
1914.	Aug., Sept.		122·6	126·4	125
	Oct., Nov., Dec.	124·2	125·5	127·3	126
1915.	Jan., Feb., Mar.	136·5	142·3	150·2	143
	April, May, June	151·2	151·2	147·7	150
	July, Aug., Sept.	149·1	149·8	151·6	150
	Oct., Nov., Dec.	153·2	159·1	165·1	159
1916.	Jan., Feb., Mar.	174·5	182·2	182·4	180
	April, May, June	190·5	196·3	191·5	193
	July, Aug., Sept.	191·1	198·7	201·0	197
	Oct., Nov., Dec.	208·7	217·2	223·0	216
1917.	Jan., Feb., Mar.	225·1	230·5	240·9	232
	April, May, June	244·5	246·0	—	—

Dates.		*Statist* index numbers.			Quarterly average.
1914.	Aug., Sept.		87·9	89·3	89
	Oct., Nov., Dec.	89·8	88·8	91·6	90
1915.	Jan., Feb., Mar.	96·4	100·9	103·7	100
	April, May, June	105·9	107·2	106·4	107
	July, Aug., Sept.	106·4	107·0	107·8	107
	Oct., Nov., Dec.	110·0	113·1	118·4	114
1916.	Jan., Feb., Mar.	123·6	127·0	130·4	127
	April, May, June	134·2	135·4	131·0	134
	July, Aug., Sept.	130·5	134·5	134·4	133
	Oct., Nov., Dec.	141·5	150·8	154·3	149
1917.	Jan., Feb., Mar.	159·3	164·0	169·0	164
	April, May, June	173·0	174·0	—	—

Dates.		Currency notes. (millions).			Aver-age.	Quarterly averages.		
						Economist index aver-ages.	*Statist* index aver-ages.	Currency notes with three months lag.
1914.	Aug., Sept.		25·2	28·4	27	125	89	35
	Oct., Nov., Dec.	31·4	34·5	38·5	35	126	90	37
1915.	Jan., Feb., Mar.	35·8	36·7	39·8	37	143	100	45
	April, May, June	42·1	45·7	46·6	45	150	107	58
	July, Aug., Sept.	45·4	57·7	72·0	58	150	107	93
	Oct., Nov., Dec.	84·9	91·9	103·1	93	159	114	102
1916.	Jan., Feb., Mar.	98·8	100·9	106·7	102	180	127	119
	April, May, June	117·2	118·6	122·1	119	193	134	129
	July, Aug., Sept.	127·6	129·6	131·5	129	197	133	141
	Oct., Nov., Dec.	137·2	136·6	148·8	141	216	149	144
1917.	Jan., Feb., Mar.	143·6	144·4	144·7	144	232	164	—
	April, May, June	154·4	159·1	—	—	—	—	—

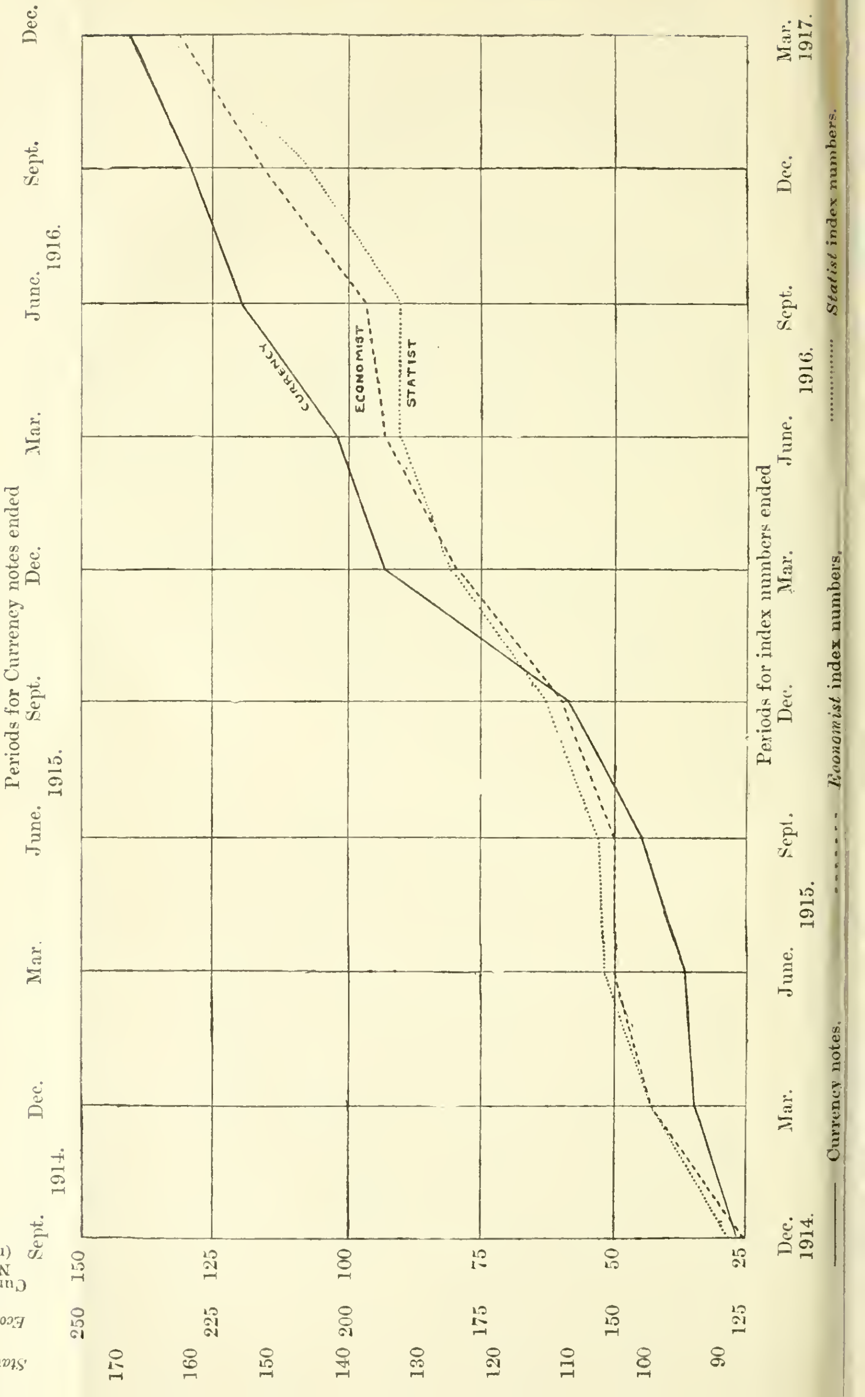
[NOTE.—The currency note values are taken at the date that is nearest to the end of a month and include currency certificates outstanding.]

"Economist" index number differences, "Statist" index number differences and currency note differences, with a quarter's lag for index numbers.



Note.—In the construction of the curves I am indebted to Dr. Casse, Lecturer in Statistics and Mathematical Economics, Edinburgh University.

Quarterly averages of "Economist" index numbers, of "Statist" index numbers, and of currency notes (taking account of lag).



Discussion on Professor J. S. Nicholson's Paper.

Mr. Hartley Withers, in moving a vote of thanks to the author, said it was an extremely easy task they had given him to propose a vote of thanks for the admirable lecture they had heard. He had looked forward to it with feelings of no apprehension until almost the last sentence the lecturer had uttered, in which he mentioned something about being censured. He felt rather anxious after that, because it would appear that if anything were said on the subject which brought it into connection with practical questions of the moment and the action of the Government, one was liable to be ejected. If that were so, his ejection might happen fairly early; because he felt, although they owed very great thanks to the lecturer for the scientific detachment with which he had discussed the question, yet, although he thought they had all to follow his excellent example, and bring that frame of mind to bear upon it in arriving at conclusions, nevertheless, if, as he believed, the lecturer was right, then this was one of the most practical questions of the day, and the whole question of inflation was one in which the Government's financial policy was very much open to criticism. He hoped if that were the actual case, that they were at liberty to discuss that point of view this afternoon: and any of them who arrived at that conclusion, were bound to bring home to the public and their friends in every possible way, any dangers that might be arising from that policy. He wished elucidation from Professor Shield Nicholson with regard to one or two details. He ventured to think that in discussing the question of the extent to which Treasury notes had taken the place of gold, he ruled that hypothesis out, and overstated his case just a little to that extent. Did not he rather forget that the Treasury notes, first of all, came out to meet the want of currency which was produced by the crisis which overtook not only the City of London, but the whole of the country, in August, 1914? The situation then was, that the public and the banks were hoarding gold, and the Treasury notes were wanted to supply currency for the public, which was literally short of it. He understood the Professor to tell them that the gold was then still effectively in circulation; but he begged to differ from him, with all respect, on that point. As far as his experience and recollection went, gold never came back effectively into circulation to anything like the extent to which they had been accustomed before that crisis. The public continued to hoard it to a certain extent, until patriotic appeals brought out most of it; though at the time of the War Loan, as late as last January, it was found that the appeal to investors then produced a very large amount of gold. They must also remember that much of the large increase in the Bank of England's holding of gold, as pointed out in the paper, was then held abroad, in Canada, South Africa and elsewhere; and he did not think that that gold held abroad, most of which, as a matter of fact, was afterwards shipped to neutral countries in payment for things wanted for the war, could be considered to have been an item in the inflation here. With regard to the amount of gold that was supposed to have been taken from the banks, they had no actual knowledge about that owing to the deficiency of banking statistics. But he would like to suggest to Professor Shield Nicholson that his assumption that a very large amount of gold had been surrendered by the banks since the war, was one that required investigation. One bank chairman, at least, had stated in public at his meeting at the beginning of this year, that his bank held at the end of last year more gold than they had ever had in their history, and several bank managers in the City had told him the same thing. He was not at all sure that the gold holding of the banks was now much less than it was before the war. He thought they could be very sure that there was very little now held in people's pockets and safes, and there was practically none in circulation; but that was all they could be sure about. With regard to the increase in the total volume of currency in the country, he took it, after Professor Shield Nicholson's Paper, there could be no question; but he also ventured to suggest that the most important item in the increase was that of the bank deposits, which had been largely brought about by the Government's finance, which had made its arrangements for paying for the war, partly by taxation, partly by loans got from investors, and partly by what he thought they might call "inflation," which was involved by the Government's habit of borrowing from the banks instead of from investors. It was an extremely natural thing that the Government should have done that. In time of peace, it always financed itself over periods when taxes were not coming in by "Ways and Means" advances and Treasury bills, and so on, by means of which the banks created credits for it, which were shortly cancelled. They were quite small in comparison with the enormous total of the transactions, and had no effect. The Government in that respect followed the pre-war practice; but he thought it was following it to an extent which was now having highly dangerous effects, because the rising prices and increased cost of the war caused increased dissatisfaction among the working classes, and made it difficult to keep them steadily at work, because they were always, and naturally, suspecting profiteering, exploitation, and so on. He believed it had always the very serious effect of depreciating the English pound, as reckoned in the currencies of other countries, that was to say, turning the Exchanges against England. Although that now did not particularly matter, because the English gold standard was at present protected by the submarine, owing to its fortunate power of increasing the cost of shipping gold, yet, when that protection was withdrawn at the end of the war, it might make the first few months of peace, which would be an extremely difficult period, a very awkward one indeed for the maintenance of the gold standard. From all those points of view, it seemed to him that this was one of the most practical questions that could be discussed at the present moment; and he wished for further illumination on that question, on page 480 in the Paper, of whether the rise in prices did not sometimes produce inflation. He was one of those people who preferred to take the simpler method, which Professor Shield Nicholson had told them was unscientific, which he was quite prepared to admit. He saw a great addition to the currency; he saw a great rise in prices; and he believed that the addition to the currency was one of the chief causes of that rise in prices. He was told that an alternative explanation of the relation between the two increases was, that the rise in prices was due, in the first place, to obstruction of supply and intensification of demand, and with that rise in prices more currency had been called for to do the monetary work. He asked whether that were so. When the war happened, they were told that a great many people wanted to hoard not only money, but many kinds of goods, and went to their grocers and bought goods for some time ahead, because of the rise in the price of certain things. But if that rise had not been accompanied by an increase in the amount of currency, then surely the rise could not have been general. The increased amount of currency, which would have been absorbed by these articles which were in special demand, would surely have diminished the demand for other articles, the consequence of which would have been that their price would have fallen, and the labour and energy put into the producing of them would have been diverted to producing the articles of special demand, and so the increase in their prices might have been modified or checked. It seemed to him impossible, unless they had an increase in the currency, or an increase in its velocity which came to the same thing, that they would have a general rise in prices, on which point he would like to hear more from Professor Shield Nicholson. In conclusion, he said there were many other people who had much to say on the subject, and there was less reason for him to talk, because he had the honour of editing a newspaper in which that subject had been discussed at considerable length lately. He would therefore end by moving once more a very hearty vote of thanks to Professor Shield Nicholson for his excellent paper on this most interesting subject.

The Right Hon. FREDERICK HUTH JACKSON said he had the greatest pleasure in seconding the vote of thanks to Professor Shield Nicholson for the admirable paper he had presented to them. He was very much interested in what he had said with regard to the Treasury notes, and he wished to say a few words on that subject, following up what Mr. Hartley Withers had said. As Professor Shield Nicholson pointed out, it was most interesting to note how the rise in prices followed the issue of the currency notes, and he thought that during the first months of war there was no question that the Treasury notes were a serious inflation of the currency. Because they would remember that during the first five months of the war, the closing months of the year, there was no general rise, but on the contrary, rather a fall, in prices, and there was no apparent evidence of any reduction of the gold circulation in this country amongst the people. That only followed later. It seemed to him, therefore, that during those months, at any rate, and probably for some considerable period of 1915, the Treasury notes in circulation were a real addition to the currency of the country. Subsequently, however, as they all knew, partly for patriotic reasons and partly perhaps for other reasons, gold ceased to be the normal currency of this country, exchangeable between man and man. It appeared to him that what they had to try and compare was the volume of the Treasury notes, as compared with the volume of the gold previously in circulation. The estimates with regard to the amount of gold in circulation were necessarily rather rough, although he thought the figure of 100,000,000 to 130,000,000 had been mentioned. If that gold had been withdrawn from circulation, it would appear that as far as Treasury notes were concerned, the amount of those now in circulation did not afford such a very large addition to the total currency of this country as would otherwise have been the case. He asked whether Professor Shield Nicholson could give any comparative figures on that point. There was no disputing the fact that they had now an abnormal rise in wages, in prices and in profits. With regard to the rise in prices, part of that was probably due to inflation of currency ; but he was inclined to the view that Tooke held in the early part of last century, that the determining influences were the course of the seasons and the obstructions to supply caused by the state of war, adding thereto what Professor Shield Nicholson had himself pointed out, namely, the intensification of demand. That seemed to be a very important factor. It was not only that there was an increased demand for things, but that there was an increased demand for things all at the same moment. The Government wanted everything at once. It was a war emergency. That seemed to be probably a very potent factor with regard to the rise in prices. It was true that it might only apply to begin with to raw materials ; but he thought it followed that gradually it would extend to other things. The very thing which Mr. Hartley Withers had pointed out about people hoarding in anticipation of requirements, would also in itself tend to intensify the rise in prices ; but they might say that that would only be limited in its application, and would not account for the very general rise in prices. To look at it all round, he was inclined to feel that, while a certain amount of the rise in prices was due to the inflation of the currency, the greater part of it was due to the obstruction of supply and intensification of demand due to the war. Professor Shield Nicholson, on page 473, quite rightly said that a rise in prices, if the volume of trade remained the same, would raise the country clearings in the same proportion. That was, broadly speaking, correct. And later on, on page 475, he said, "It is also often supposed that if for any reason there is a general "rise in prices, there must be a corresponding and proportionate "increase in the various forms of currency to do the money work "at this higher level." He limited that to a corresponding and proportionate increase. But the speaker ventured to submit to him whether the increase in currency might not be greater than the proportion which he suggested, and that it would not only correspond to, but might possibly exceed the increase in prices, especially where the increase in prices was, as on the present occasion, accompanied by such a very large increase in wages. It appeared to him that those two factors, the increase in prices and the increase in wages, together might cause a very much larger demand for wages and purchases than the increase in prices alone. He therefore thought that they could quite well go further than Professor Shield Nicholson did, and argue that an increase in prices, when accompanied by an increase in wages, might lead to a much larger demand for currency than the proportionate amount justified by the rise in prices. He concluded by cordially seconding the vote of thanks to Professor Shield Nicholson.

The CHAIRMAN intimated that, owing to the time being limited in view of the fact that the Annual General Meeting was to be held afterwards, the time would be quite inadequate for a proper discussion of the paper, and that those who spoke afterwards should be as brief as possible.

Sir TIMOTHY COGHLAN suggested that if the discussion were closed shortly, another evening might be devoted to it. It was one of the most interesting papers that could possibly be brought before the Society, and apart from the learned Members of the Society, it might be enlightening to the public at large.

The CHAIRMAN said he thought it was quite advisable that they should have another meeting to discuss the Paper; but he was afraid the author would not be able to be present. He asked the opinion of the meeting on the question.

Mr. ROZENRAAD said he hoped there would be another meeting, because it was absolutely necessary that a comparison should be made of the present situation in Great Britain with the situation abroad. It was not only at home that there had been an inflation of the currency, but everywhere. He had made a calculation of the issue of bank notes by twelve of the principal European issue banks. At the beginning of the war, their notes were in sterling 845.000,000. and on June 18, 1917, 2,768,000,000. Besides, in Great Britain and Italy, notes had been issued by the British and Italian Treasury for a large amount. But he had not heard that Professor Shield Nicholson had mentioned the principal cause why prices went up, which was because there was a balance of trade against this country, and against every country in Europe. The imports in this country exceeded the exports by about 400,000,000 sterling, and the more they imported the more the rate of exchange became unfavourable —for, at the same time that the imports were increasing the exports declined, as there were less ships available. Besides, there was labour trouble, the sea was unsafe, and so on. The difference between imports and exports was in normal times covered by freights, by money spent here by foreigners, by the interest on foreign securities, commissions, brokerage, &c., but now these items did not exist on such a large scale as before. The tendency of the foreign exchanges, which again had not been mentioned by the author, was also against this country. For instance, this country paid now between 17 and 18 per cent. more on everything it imported from Spain, and he could cite the example of many other countries. The rise in the rate of Exchange, as a result of an unfavourable balance of trade and balance of payment, had led to the increase of prices, and when prices went up, it stood to reason that they had to issue more notes, the more so as the floating population of the country is, since the war, much larger than before. All this not only increased the prices of all commodities but also of wages. The general aspect would alter immediately if ways and means could be found to improve the national balance of trade and the national balance of payment. This was the more necessary as Great Britain had, continually, to help the Dominions and the Allies, and the more help Great Britain gave the more notes had to be issued. If another meeting were held, which he would strongly urge, more particulars could be given concerning the tendency of the balance of trade and the balance of payment, the foreign exchanges, &c. The whole question was not only of national but of international importance.

Mr. MORETON FREWEN said he could not altogether agree with Professor Shield Nicholson's view that there was any close connection between the currency and prices. In his judgment, the last speaker was not in line in suggesting that because the balance of trade was against us, and the exchanges unfavourable, that had anything to do with the present huge advance of prices. We usually rely on adverse exchange to export gold and put prices down. With an immensely favourable trade balance, the United States has to-day a considerably greater advance of prices than this country. In Canada, where he thought the currency had been rather starved by its Government during the war, they there had experienced a larger advance of general prices than was the case in Great Britain. The whole situation was complex and interesting. He thought had there been no war at all, there would have been an immense advance in prices. Look at fish prices on the Pacific Coast of America. The price of fish in Prince Rupert, such as salmon and halibut, had risen 400 per cent. since the war, whereas in this country similar fish has only risen 100 per cent. or perhaps 150 per cent. Notwithstanding the immense advance in ocean freights, the rise in the price of fish, or of Western wheat on the farms, had actually been greater in Western Canada than here. There was something very mysterious about the rise of prices. He was doubtful whether there had been any great inflation. They must certainly have had 40,000,000 sovereigns in the tills and pockets of the people when the war broke out. The place of that had no doubt been taken by the issue of small notes. It would not be patriotic at the present time to go into the question of gold reserves in this country; but he would be very much surprised if the inflation of the full legal tender currency was anything like what it was supposed to be. We had lost much gold, and a pound note was not nearly as efficient a money investment as a sovereign. Referring to silver, Mr. Goschen's statement, which had generally been accepted, was that the saturation point for silver in this country was 13*s. per capita.* If the Mint issued more than 13, the silver came back. The very large increase in the coinages of silver in the last three years, he connected with the hoarding of silver currency. The less intelligent sections of the community were hoarding silver against a rainy day, just as another section was hoarding gold. He thought that probably accounted, rather than anything else, for the immense increase in the coinages of silver.

Mr. PERCY WALLIS asked the author whether he had attempted to make any experiments to test the question of currency. If there were direct connection between currency and prices, it should be possible to forecast the price of commodities, or forecast the acreage under wheat, &c. He had for some years made attempts to make forecasts of this kind, from a different theory to that of Professor Shield Nicholson, and unless there were experiments put against it in a similar way, he thought it was fair to say there was no ground, as far as his experiments were concerned, to show that currency had had any effect upon the prices. It was impossible to give the Society any idea of the experiments he had made, owing to the shortness of the time; but he asked the author if he had attempted to test the currency theorists.

Mr. J. E. ALLEN asked the author if he saw any reason why there should not be a definite percentage of gold, earmarked against all currency notes. It seemed to him very wrong that say, 100,000,000*l.* should be added to the Treasury note issue, and not a single sovereign put down as a reserve.

Mr. PETHICK LAWRENCE said that some people were discussing whether the increase of prices was due to increased demand or due to inflation. He suggested the two things were really identical. Inflation was only a means by which the increase of demand expressed itself, and in this war, where there was an immense increase of demand for current commodities of various kinds, that expressed itself, first, in a form of inflation, and then ultimately in a rise of prices. The moment they included in currency things like bank deposits, that was the only way in which an increased demand could express itself, whether it be on the part of a private person or on behalf of the Government, and the issue as to whether the Government tax or the Government borrow is different only because of the psychology of people. If the Government were to tax, and the people were to borrow in order to pay that tax, inflation would be reached just in the same way as if the Government borrowed. As a matter of fact, when the Government taxed, the inclination of people was to try and pay that out of current income, and to that extent cut down their current demand. In that way, when the Government taxed, they did not get inflation, including inflation of the various forms of currencies, such as bank deposits, cheques relating to bank deposits, and all the other things; but where the Government borrowed, you did obtain all those forms of inflation. The point he made was that, to his way of thinking, there was no quarrel whether it was demand or inflation. One was merely the numerical form of expressing the other.

Mr. FALK said he wished to support what the previous speaker and Mr. Hartley Withers had said. Mr. Huth Jackson had laid great stress on the fact that the rise in prices might be due to great intensification in demand. He asked what that meant. What did they give for goods when they had an intensification of demand? They did not give other goods, but money, and unless they had more money to give, they could not have an effective intensification. Also unless they had a decreased demand, so long as the Government created the purchasing power, they would have a rise in prices. As the intensification in demand could only become effective if more purchasing power was created, they could not really say that one or the other was the cause. They were both the cause, and as the Government had to have the goods, the intensification of demand and the rise of prices would continue unless the public decreased its demand. He thought that explanations on the lines of that given to them by Mr. Huth Jackson and many others diverted attention from what was really the essential feature of the present situation.

The CHAIRMAN said he was afraid he must now put the vote of thanks, owing to the time having expired. He wished to add that he did not see that there was any impossibility of having another meeting to continue the discussion, if the Fellows were in favour of it; but they could not hold an ordinary meeting between July 1 and November 1. This, however, would not prevent their holding another meeting this day week if they so wished.

The vote of thanks was carried unanimously, and the meeting adjourned, for further discussion, to Tuesday, June 26.

Professor J. SHIELD NICHOLSON, in reply, said he was very much obliged to the meeting for the cordial way in which they had received the Paper. It was quite impossible for him in the time at his disposal to reply to the various points which had been raised. It was very inconvenient for him to come so far to attend a meeting twice at so short a date; but he would be extremely glad to give a reasoned reply to any subsequent discussion before the publication of the Paper. That might perhaps be more useful than the actual giving of a reply *viva voce*. There was, however, something in the spoken word that was sometimes more effective than the written word, and there was time for him to refer to two points. On the last point emphasized by Mr. Falk and Mr. Pethick Lawrence, he was at one with the speakers. He had tried several modes of beginning the Paper. One way of beginning it was to explain what was meant by intensification of demand, and he went back on what he was accustomed to teach in his political economy, that any demand to be effective must be backed by corresponding means of purchase. The mere desire was no good. They must have money. Unless they had, there could not be an effective demand. He quite agreed with those speakers. They might call it intensification of demand, but it must be backed by those means of purchase to operate upon prices. With regard to the experimental test, he said that the late Robertson Smith, who was a great authority on Eastern matters, had once told him that it was characteristic of famines in the East that there was scarcely any rise in prices at all. There was, of course, intensification of demand by their demanding as much as ever they could; but all the same, the prices did not go up, because there was not enough currency. They had not any more silver, and could not raise the prices. If they had had a benevolent Government to issue notes for one and two rupees, as it was rumoured the British Government was proposing, they would manage to raise their prices. In this country the Government credit had to be pulverized into different forms of currency. It was no good the Government getting a loan from the Bank of England, unless it could translate it into payment of wages, and so on. Then an effective demand for labour could be made. Referring to the relation of Treasury notes to gold, he said the point he wished to make was that the gold was still used as part of the monetary power of the country, and they ought to take it that one of the principal functions of gold under normal conditions was certainly to provide the ultimate reserve in the banks. He was told what he did not know before, that the banks had actually retained a vast amount of gold. If so this was used most effectively as money power. The currency notes were doing the work of internal circulation equally well with the gold, and the gold in reserve rendered it more possible for the banks to extend their deposits, and assist the Government in different ways. As far as his Paper was concerned, if the gold were still used by the banks, it formed part of the effective money power of the country, and they must therefore consider the notes to be an addition to the currency. The precise location of the gold in reserve whether in Canada or elsewhere did not affect the argument, so much less had to be exported from England in case of need and the monetary power of England was so far greater. He would welcome extremely any criticisms or suggestions which might be made in reference to his Paper, and if they were presented to him, he would be only too glad to consider them, so as to work them into the reply in connection with the Paper which would be published in the *Journal.*

ADJOURNED DISCUSSION ON PROFESSOR J. SHIELD NICHOLSON'S PAPER, Tuesday, June 26, 1917.

The President, SIR BERNARD MALLET, K.C.B., in the Chair.

THE CHAIRMAN, in opening the discussion, said the adjourned meeting was somewhat of an experiment. He did not know that there was any precedent for adjourning a meeting and having another one the following week to further discuss a Paper; but he was glad to think it was justified by the attendance. They had a sufficient number of gentlemen present who were anxious to discuss the question, and the meeting was further justified, he thought, by the extreme importance of the subject and the importance of trying to clear their ideas as to the various points raised by Professor Shield Nicholson, such as the effect on prices of the enormous increase of credit, and so on. It was not very easy to treat it statistically, and he thought they would probably allow themselves a little latitude in their discussion. He was sorry that Professor Shield Nicholson was not able to be present. He had written to say that he had a very busy week of university work in Edinburgh. They would, however, be able to give him some account of what had passed, and no doubt he would write a reply to the criticisms if he thought it necessary.

Mr. F. FAITHFULL BEGG said they would probably agree with regard to the first four conclusions in the paper that they were largely matters of fact, and, while they might be arguable or discussed, he did not intend to offer any remarks with regard to them. He wished to say one or two words with regard to the concluding item. The last sentence read: "If the inflation of the currency "continues a rise of prices will also continue." His criticism upon that was, that he did not think that that conclusion followed in any sense from the premises. He said that, because the statistics which they were given in the Paper were entirely local statistics, and it seemed to him that unless more general statistics were introduced the conclusions of the Paper must be weakened, if not altogether faulty. In other words, he thought that the causes which were stated as the reasons for the conclusion to which Professor Shield Nicholson came were only contributory factors, and it did not in the least follow that the same conclusion would be arrived at if the field of vision were further extended. It seemed to him quite reasonable to argue that all the facts which were given might be overshadowed by the larger facts if the larger facts were examined in the same form; and not only overshadowed but might even be nullified, although he did not argue that that was so. What he meant by entirely local statistics was that the figures given were confined to Great Britain, and he thought that at least similar figures, particularly with regard to the currency question for countries on the Continent, were necessary before they could come to any definite conclusion. He would go even further than that, and suggest that similar figures for the whole world would almost be necessary before he personally could agree that the conclusions were sound. Taking the item of currency, he had run out some figures with regard to the three principal countries in Europe which were engaged in the war, namely, France, Germany and Russia. With regard to Germany the reservation must be made that, as they understood it, a large amount of fiduciary or subsidiary currency had been issued, of which no record appeared in the figures of the Reichsbank. He did not know how far that would affect the conclusion to be drawn from the figures; but certainly it would accentuate the effect if it did anything at all. There was one fact which was clear in connection with those three countries, namely, there was a very large increase in the note circulations, both actual and as compared with the percentage of coin held. The percentage had fallen heavily in the case of those three countries. In France the percentage of gold to circulation when war broke out was 71·3 and was now 28·0; in Germany it was 79·4 and now 31·4; while in Russia it was 111·3 at the outbreak of the war—that was to say, the coin was in excess of the circulation—and it had now fallen to 30·5. The grand totals were that there had been an increase in the total amount of coin, gold and silver included, to the extent of 268,000,000, and there had been an increase in the circulation to the extent of 1,896,000,000 in the combined figures of these three countries. There were also increases throughout Europe, but those were relatively small in amount and he had not taken them into account. This inflation of the currency on the Continent must necessarily affect the calculation. The next point was that he thought they might safely say that the prices of commodities and wages were not local prices in any sense but were world prices. We were governed and controlled in our prices to-day by world prices, which of course dominated local prices. This effect was greater perhaps in the case of commodities than in the case of wages. There was practically no reference in the Paper to these outside influences except a reference to the United States; and while he had not had an opportunity of going into that, he thought that, in that reference, Professor Nicholson took the wrong view because he indicated that there had not been a similar increase in prices and wages in the United States, whereas, if he (the speaker) was not wrong, prices there had risen just as they had elsewhere. The third point he wished to make was, that there were other influences which must have had a very considerable effect, but to which no reference was made in the Paper. There was, first of all, the deficiency of supply. It was notorious that the harvests all over the world were not up to the mark this year; and there was here and elsewhere a large shortage of labour owing to men having been drawn off from their ordinary vocations on account of the war. He thought it would be accepted as a fair statement that a deficiency of supply caused a price advance in excess of the degree of the deficiency. That is to say, if there was a given deficiency or given excess, in supply, there was produced a larger effect on the result in price, either up or down, than the proportion of the excess or the deficiency itself. This was notably so in the case of the Napoleonic wars. Another item which came under the same head was the deficiency of transport, which was to-day almost a governing factor in all prices. So many ships, both of our own and other nations, had been drawn off for the purposes of the war, that it was notorious that supplies could not reach their destination; not only so but the commodities themselves in many cases could not be transported at all. Summing up, he wished to say that it appeared to him that the method of the paper was faulty, and its conclusions were vitiated, first because of the limited area of the figures dealt with; second, because prices and wages were world-controlled and could only be modified to some extent by local conditions in any part of the world, whilst there was also the omission to consider the effect of a deficiency of supply and of transport. The Paper was an interesting one, and the tables would be useful being in a compendious form for the purpose of reference; but he suggested that in many cases they were a little out of date. Although in some cases they were brought up to date, in other cases they were only dealing with the period immediately succeeding the outbreak of war, before really the influences which would follow it had time to have any play or effect.

Mr. C. ROZENRAAD said Mr. Faithfull Begg had confirmed what he (the speaker) had told them at the last meeting, that the present inflation of the currency was not only a question of national but of international importance. In all countries, at war or not, there was an increase in the issue of notes and everywhere a rise in the prices of commodities and of wages. Mr. Faithfull Begg had given them the figures of three banks which had increased their issue of bank notes. At the last meeting he, the speaker, had given figures for twelve European banks, which, at the beginning of the war, had a circulation of bank notes of 845,000,000 and to-day had one of 2,768,000,000. He did not include in that, the issue that was made by the Treasury here, of notes of 1*l.* and 10*s.*, nor the notes issued, besides the circulation of the three issue banks in Italy, by the Italian Treasury. According to his view, the cause of the depreciation and inflation of the currency, leading to an unfavourable tendency of the exchanges, in many countries was really that nearly all nations worked with a balance of trade against them. He did not speak of America or Japan, who had an export balance, but all the other leading nations had imported more than they exported. The result of course was that prices went up, and if prices went up they wanted a larger amount of circulating medium, that is, more notes. And as credit balances abroad were much reduced, payments to foreign countries had to be made in gold securities, &c. We have seen that repeatedly in our dealings with several neutral countries, and the more the foreign exchanges are against Great Britain the more we have to pay for the commodities that are imported. The result was that there was a rise in prices and the rise in prices led to an inflation of the currency, as the inflation in the currency led again to an increase in prices. It was, really, a vicious circle. He therefore suggested that as it was of the greatest importance to study the whole position, they should examine the question thoroughly and give as many statistics, national and foreign, as were available. England had still, notwithstanding the competition of other countries, a large foreign trade, and it would be useful to examine to what extent that trade had been affected by the inflation of the currency and by the tendency of the foreign exchanges. Of course all details could not be given because the statistics of many countries were not up to date, but he saw the possibility of giving the statistics of at least twenty-four countries. They had also to take into consideration the different monetary systems. For there are countries where the principal circulation consisted of gold, others of gold and silver or with neither gold nor silver. The price of freights, of insurance, and many other items had also to be taken into consideration. In a word, it would be a great, but interesting, work and if a few gentlemen took it in hand, he thought it would not only be useful to Great Britain but to the whole world.

Mr. Moreton Frewen said they were all very much interested in Professor Nicholson's invaluable Paper, and the more one studied it the more interested one became. He (Professor Nicholson) had the fact of paper inflation and the fact of the great rise in prices, and very naturally connected the two as cause and effect. He did not suppose that anybody there denied that a great inflation of the currency such as they recognised—an inflation of every sort of currency and credit instrument—would have an effect on prices; but when they were dealing with a rise from 80 to an index number of 180, there was room in such a rise for a great many conditions which made for higher prices, and he ventured to think that Professor Nicholson failed to make good his case. He agreed with Mr. Faithfull Begg that there was a great deal of elbow room in those colossal figures without attributing the rise of prices to the inflation of our currency. It was an extraordinary question. He was with Mr. Rozenraad in thinking that if they could get a committee of experts representing that Society or the other learned societies to take evidence and report on this question during the next few months, it would be very educational. It was no use any of them coming to talk there for half an hour. That could at best arouse a local form of interest. They really wanted a report from a learned body which would guide public opinion. Had there been an inflation here? What was inflation? He drew attention to the figures that had been recently advanced by Mr. John Rovenski, who was the Vice-President of the New York Bank of Commerce, who had to guide the Director of the Mint's figures at Washington of the movements of gold, as the result of the war. The figures were important. He showed that they in England had lost 35 per cent. of their gold, which would be about 60,000,000 of sovereigns. If they had lost 60,000,000 of sovereigns and had in place of these sovereigns a mass of paper, say 150,000,000, would that amount of inflation affect prices? He was inclined to think that the 150,000,000 of paper might be less effective in controlling prices than those 60,000,000 of sovereigns we had shipped to America. He did not think because they had lost 60,000,000 of sovereigns and got 150,000,000 of paper pounds, that showed of itself any inflation of the currency. Mr. Rovenski pointed out that the United States had increased its gold since the war by 49 per cent. If that were the case, the United States had drawn from outside countries rather over 100,000,000 sovereigns of gold, and that in connection with their new Federal Reserve Act would amount to a very lively inflation in the case of the United States. He thought they had in this case distinct conditions of inflation—an immense importation of foreign gold, and the new Federal Reserve Act coming into force and a very great rise of prices in the United States. If prices were to advance so enormously as they had in the case of an important country like the United States, they must inevitably pull up prices here, we being inevitably immense purchasers in the United States. Perhaps a rational view of the great rises of prices all the world over was that that immense customer, the United States, had really inflated its currency by the importation of a hundred millions of new gold and also its new Bank Act has in it the possibilities of a great inflation of the currency. If prices rose so enormously in America, as they had, they would have to rise here. We here are very voracious buyers of United States products, and we had to compete with the prices obtaining there. It seemed to him then that the immense rise of prices in the United States would almost of itself account for the great rise of prices all over the world. The late Mr. James J. Hill, who was a profound economist as well as a great railwayman, used to talk to him about that question a great deal; and he could not help thinking that the keynote of prices all over the world was the fact that the extreme protectionist system of the United States had upset a sort of natural equilibrium in that great country between the agricultural and the manufacturing industries. At the present time the United States was turning out annually over 5,000,000,000 sterling of manufactured articles; and whereas when he first discovered, the United States 30 per cent. of her people were in her towns and 70 per cent. on her farms, the proportions were now reversed and there were 70 per cent. of her people now in the towns and 30 per cent. on the farms. The demands on the part of these City myriads for agricultural produce were becoming so colossal that even if there had been no war he thought there would still have been a very great increase everywhere in the cost of living. In the last three years the United States had tapped one of our great sources of supply, the Argentine; and he went so far as to say that if the United States kept up on its present industrial lines for a few years more the cattle trade of Ireland would turn round and go to New York. Elsewhere, too, the economic conditions, he considered, were considerably responsible. The currency no doubt had something to do with the rise of prices, and perhaps the immense withdrawals of labour for the war had had a great deal to do with it; but the primary cause was the great shortage of supplies. Mr. Hill had used to say: "Where are we going to get our food supplies for 200,000,000 "of people which we shall soon have?" The *per capita* consumption of wheat in the United States was eight bushels, and Mr. Hill would ask: "When we have 100,000,000 more people here, where "are we going to get that additional 800,000,000 bushels of wheat?" Then take the case of meat. Quite evidently for the last fifteen years they had been living not upon the income of their flocks and herds but their principal, and thus it had been a profound problem of the last fifteen years where the meat supplies of the world were to come from. He believed that they were in full sight of a great rise in the cost of living as compared with before the war, and that a great portion of the present advance was not connected with inflation. If it were possible to get a committee of experts to take evidence and report, great good might come of it. He drew the attention of that learned Society to the fact that the situation of the Indian exchanges to-day was extremely perilous, and he used the word deliberately. They knew that India always had a very large favourable balance of trade, which balance of trade India drew in precious metals and had done for hundreds of years. He referred to a statement in the Gold and Silver Commission nearly fifty years ago, in which the Commission had said that "the trade balances "between 1848 and 1877 in favour of India amounted to 511,000,000 "sterling," and they added that this was largely in excess of all the gold which came during those years from Australia and California combined during those years of the maximum output of gold. He was greatly alarmed to-day for what gold we still had, and the other gold to the extent of 100,000,000 which was happily set under lock and key in the United States Treasury. If the war was over and that gold released, the present exchange condition in India was such that a great mass of it—it was conceivable the whole of the 100,000,000—would find its way to India in one, two or three years. They would follow from the fact that prices had doubled since the war, that this also doubled the amount of specie which was required to meet those favourable Indian trade balances. Where one sovereign used to go, two would now be sent because of the rise of prices. They must remember that they tampered with the standard in India in 1893. Whereas India always had a silver standard, they had given her a gold standard, and there were great masses of gold liberated in her currency. They would find in the 19th century that India had drawn her trade balance as to 80 per cent. in silver and 20 per cent. in gold. Since they had altered her standard to a gold standard, the reverse of those figures was almost true. That is to say, taking the amount of specie drawn into India since her standard was tampered with, she had drawn almost 80 per cent. in gold and 20 per cent. of silver. It was the most alarming fact in the world that India, which they used to call "the sink of silver," had now become the sink of gold. She had drawn at least 150,000,000 of gold since 1893, and to his mind that was the leading economic fact connected with the world's currency and exchange to-day. The government of

India had scraped the silver market absolutely bare in the last few months. The total annual production of silver from the mines was at the present time 200,000,000 ounces, of which the silversmiths took 115,000,000; this left only 85,000,000 ounces for the currency requirements of the world, and the Government of India had bought 130,000,000 ounces. Thus the Government of India, for the purposes of the rupee currency, had bought far more than all the surplus of the world's mines. In their purchases they had practically drawn the whole of the Philippine silver currency into the melting pot, had taken at least 8,000,000 ounces from Hong Kong, and something like 35,000,000 ounces from China, and notwithstanding to-day there was an actual rupee famine. A friend of his had written by a recent mail from Calcutta saying that if the Government, instead of selling 120 lakhs of Council's Bills each Wednesday in the Bank of England, sold 500 lakhs, it would not supply the amount of currency that the Indian trades require at the present time. The disappearance of the rupee and the absolute disappearance of the 150,000,000 of sovereigns, which they had pitched into India, made a laughing stock of the theory of the Foreign Exchanges. The only thing that could possibly relieve that famine was either gold or silver. If they got their gold back from the United States with Indian trades and exchanges where they now where, in two years they would lose at least 100,000,000 of gold. For there was no silver to go to India. For the first time in history the conditions of demonetisation of silver had so discredited silver and closed down the mines that they had run into a great famine of this metal which Bagehot described as "the normal money of mankind." To conclude, a committee of the right kind appointed without delay might warn effectively the world of finance of the breakers just ahead. No drilled Government Commission with a panel of rehearsed witnesses was the least good. It should be a committee of business men—exchange brokers and arbitrageurs. The Indian exchange banks are able to supply the commissioners and the witnesses we need. It were fitting did such a Committee assemble during Sir Bernard Mallet's term of office, for no one was more perfectly the master of this great exchange problem than his father, the late Sir Louis Mallet. From that most admirable teacher he had himself learned in the 'eighties the incomparable importance of the silver question.

Sir James Wilson said he had been reluctant to speak in an assembly of so many experts, because he was not an expert himself. But he would like to say, with some of the other speakers, that while Professor Nicholson had given them a very valuable collection of statistics about the inflation of currency in this country,.he seemed to have been too hasty in his conclusions. So far as he could judge, he did not think that the rise in prices in England was to any appreciable extent due to the inflation of currency. If the issue of a greater quantity of silver and bronze currency were considered a cause of the rise in prices, that was putting the cart before the horse. It was the effect of the rise rather than the cause. He understood the Mint only issued silver and bronze currency in answer to demands for it; and it was only because since the war began it was asked for more silver and bronze currency that it issued more than before. The reason for that larger demand was obvious. A rise of prices meant that people who bought a very large amount of commodities in small quantities, for which they had to pay in silver and bronze because each purchase was less than a pound's worth, would in many cases require a larger amount of silver and bronze money in order to pay for them; and therefore a rise of prices, taken by itself, was likely to lead to a larger demand for bronze and silver currency. That, he thought, was the cause of the greater issue from the Mint of those two forms of currency. The issue of 1*l.* notes no doubt had, taken by itself, added to the amount of currency in the hands of people; but on the other hand a large quantity of gold was withdrawn from the currency, and it was not fair to reckon that the notes which were in the hands of the people and the gold which was reserved in the banks, were both available in the same way and to the same extent for the purposes of every day currency. He also thought that Professor Nicholson did not take fully into account the distinction between convertible and unconvertible currency. The ordinary 1*l.* note and 5*l.* note were still in reality fully convertible, as they were before the war, and any man who wished to hoard gold would have no difficulty in doing so. If he wanted to hoard 100*l.* in sovereigns, he had only to draw 100*l.* in 5*l.* notes, go to the Bank of England and demand the gold, which must be given to him in compliance with the law. So also if one of the large banks in the city wanted a million sovereigns, it had only to present a million pounds worth of notes at the bank and it must be given one million sovereigns. If one came to think on what was going to happen after the war, there was an important question connected with the inconvertibility of some currencies. Taking the case of Germany, where the exchange value of the mark had fallen so greatly, prices were at present quoted and goods paid for in paper marks. As regarded the internal trade of the country, that was all very well; but when Germany had to deal with the world outside it had to pay for what it bought, not in paper marks, but in gold. Comparing the prices of wheat in different countries, about a month ago in England they were paying 80*s.* a quarter, which meant the value of four gold sovereigns, as compared with the price of about 35*s.* before the war. The maximum price for wheat fixed in Germany was 260 marks per ton which, taking the mark at par as equal to a shilling, would have been equivalent to 57*s.* a quarter; but owing to the fall in the value of the paper mark it meant something below 40*s.* a quarter if measured in gold. That meant that the German farmer was getting so many marks from his Government which only came to 40*s.* a quarter in gold value, and if peace were to be declared and the world's trade opened Germany would no doubt want a large import of wheat and would have to pay something like 80*s.* a quarter in gold, the current world's price. It would be a very grave question for Germany, and therefore for the whole world, as to how the great fall in the gold value of the paper mark was to be reconciled with the requirements of international trade. There would be a great rise in prices in Germany, whether measured in gold or in paper marks, and this would have a great effect upon demand and supply the whole world over. It seemed to him that Professor Nicholson had not only left too much out of account what went on in other countries of the world, but had also lost sight of what he ventured to think was the basis of the whole question, namely, the fact that international world prices were now practically prices measured in gold; and that gold prices must be determined first and foremost by the proportion between the available supply of gold for currency purposes, and the effective demand for gold in the world as a whole. Some years ago he had had occasion to study the question in connection with the history of the rupee; and taking the best statistics available, including those published by the United States Mint, it appeared that the total addition to the world's stock of gold since A.D. 1500 had been about 3,500,000,000 sovereigns' weight. There must have been a very large quantity of gold in the world in A.D. 1500. Gold was almost indestructible. Very little of it was likely to be lost, and the quantity that was used in such a way that it could not be melted down and again made use of was comparatively small. He therefore came to the conclusion that there must be in the world at the present moment not less than 3,500,000,000, and probably nearer 4,000,000,000 sovereigns' weight of gold, double what it was sixty years ago. That great increase which had taken place in the stock of gold, one would naturally think, taken by itself, would lead to a great reduction in the exchangeable value of gold. Then as regards the effective demand for gold. They knew that in the last seventy years India had absorbed over 250,000,000*l*. worth of gold, almost the whole of which was not in the hands of the Government or in the hands of the banks, but in the hands of the people, who were hoarding gold now more than ever before. If a man had so many sovereigns or bars of gold buried in the earth and nothing would induce him to part with them, that quantity of gold was no longer available for currency purposes and might almost as well be in the quartz in the mines. Again, in 1909, the Director of the United States Mint estimated that in banks and public treasuries there were 941,000,000*l*. worth of gold and in circulation 318,000,000*l*.—a total of 1,259,000,000*l*. Since the war broke out the banks and treasuries had been getting in all the gold they possibly could, and the amount held by them must now be very much more than 1,000,000,000*l*., none of it immediately available for purposes of currency because the banks would not let it out. For example, the Government of this country held a large quantity of gold in South Africa and Canada, but they were not going to bring it here and throw it into the currency. That amount at present was not available for purposes of currency. He maintained that the first thing to consider in studying the rise and fall of prices, was: What was the relation between the supply of gold which was available for purposes of currency and the effective demand for gold itself for those purposes?

One of the speakers had said that the great danger to the future of the world from the point of view of currency was the way in which India was absorbing gold and was likely to continue to absorb it. It seemed to him on the other hand that if India had not absorbed this large quantity of gold while the mines of South Africa and other countries had continued to pour out gold in the way they had done, the gold available for currency purposes must have been much more plentiful than it was now, and prices must have gone up much more rapidly than they had done. It seemed to him that after the war the banks and treasuries of the world were likely to disgorge a large proportion of the gold they now held. They did not find it necessary to hoard such a large quantity before the war; and he thought it quite likely they would let out possibly one-third of the gold they were now hoarding, which would be thrown on the currency in the first instance. It was also possible that the people of India might after the war, when they felt there was no further danger, bring out part of their hoards and throw into the currency a considerable proportion of the gold they were now hoarding. If that happened then soon after the war ended the world would have to deal with a large addition to the actual gold available for currency purposes, and this must have a tendency to cheapen the value of gold in exchange for commodities and, taken by itself, to cause a rise of prices, or rather a less rapid fall of prices than would otherwise take place. That, he thought, was the most important question; and it would be a good thing if the committee which had been suggested would consider not only the inflation of the currency and the special reasons which had caused the rise in the price of many commodities, but the general effect of a possible great change in the relation between the available supply of gold and the effective demand for it.

Mr. J. E. ALLEN said he had not come there in order to expound his own views, but with the hope of discovering some principles and some generally accepted facts as to whether the currency had been inflated or not, and he was considerably disturbed to find that some speakers were inclined to the belief that the currency had not been inflated at all. Last year and the year before he had accepted Professor Nicholson's theory that there really was an inflation. In fact the British Association Committee's Report, to which he referred, was, he thought, the first pronouncement that there were too many currency notes. Sir R. H. Inglis Palgrave was very strong about that fully 24 months ago, and in their first report (September, 1915) the Committee said that notes were sufficiently numerous at that date. He wished to find out some principle about the number of notes which should be issued. He could not say who decided how many millions of notes should be in circulation at any moment and how he decided it. He was certainly much surprised to find what he thought the gold reserve of the banks, was held as to nearly one-half in Treasury notes. He certainly did not think that Treasury notes were the same thing as gold. Professor Nicholson did not say that the inflation of the currency was solely responsible for the rise of prices.

Mr. Faithfull Begg said Professor Nicholson's exact words were :—" If the inflation of the currency continued the rise in prices " would also continue."

Mr. Allen, continuing, said he had already quoted that in print twice. The rise would continue. They might rise 30 per cent. and only 5 per cent. rise would be due to the increase in the currency. It was just one of many causes, and he would have thought *a priori* that the fact on which Mr. Faithfull Begg laid stress, namely, the general shortage of goods, was a reason why there should not be an increase in the amount of currency required to transfer those goods from hand to hand. There were other reasons for the rise in prices besides those mentioned. The fact that the British Government and all Governments were spending money which they borrowed instead of raising by taxation, was possibly the most potent of all the causes of a rise in prices. Especially by paying it out in wages they were immensely increasing the power of people to buy goods, while, as they all knew, there were not so many goods to be bought as there were before. The public at large certainly seemed to think that the Government had power to influence prices by the issue of currency notes. He had in his hand a circular issued by the Smallholders' Union which, in speaking about the prices of wheat after the war, said : " If the price showed a tendency to fall, as it is bound to do, " the Government would have it in their power to prevent this " tendency by the issuing of currency notes to the nation." Whether that circular had any value or not it certainly showed that people thought the Government had the power of putting up general prices by issuing currency notes. He thought that was a very dangerous power to put in the hands of any Government.

Mr. H. V. Krader said he would be glad if somebody would answer the elementary question put. Presumably the man says : " I am short of money. Let us have a thousand more notes printed." He imagined that was not the method of the Government at the present time, but he asked what did determine it.

Mr. Faithfull Begg said the currency notes were issued primarily against coin of similar value, but the Government had the power to issue currency notes in blocks to banks on credit. That was to say, they gave it in the form of a certificate which was changeable for notes any moment, and the weekly notes issued showed them the amount of the certificates which had been issued and exactly how far the Government had issued notes against coin in fact. It would show the distinction between these two methods of issue.

Mr. Rozenraad added that against 160,000,000 sterling there was an actual reserve of 28,500,000, so that the proportion was only 18 per cent., which was very weak.

Mr. **Moreton Frewen** asked what was the rate the banks paid for the notes? Was it only 5 per cent?

Mr. **Rozenraad** said that was a question of arrangement.

Mr. **Moreton Frewen** said he thought they paid some fixed rate to the Government.

Mr. **Faithfull Begg** said he did not think so; it was matter of arrangement.

Mr. **Malcolm** said that if a bank took notes on a certificate, which very few of them had done, the bank paid over 1 per cent. over bank rate.

Mr. **Rozenraad** said that was not always so.

Mr. **Malcolm** said he thought it was, but the bulk of the Currency notes were drawn from the banks and from the Bank of England simply against a cheque on their balances and issued to their customers over the counter in accordance with the customers' demands.

Mr. **Faithfull Begg** asked whether they were not confusing two things. Mr. Rozenraad had mentioned the amount of coin which was held by the Government as a reserve against notes. But that had nothing to do with the question they were discussing, except indirectly. The bank which took the notes gave value by a cheque on the Bank of England, and the Government utilised that money as it pleased and did not keep cover except to the extent of the coin. But when on the other hand—which was the other side of the question—they gave the notes to a bank on credit, a different arrangement came in and those notes were issued entirely on credit. But the Government was responsible for them and the Act declared that they were redeemable in coin at face value at the bank at any moment, which was the danger.

Mr. **Rozenraad** stated that one had nothing to do with the other.

Mr. **W. Leighton Jordan** said he wished to make a few remarks on a very interesting table given to them; but before doing that he would like to say his impression had been that the Government's justification for issuing the notes commented on by the last speaker was to a great extent the fact that they held the reserves in Canada and South Africa, which two of the speakers had alluded to. He did not say that they themselves put it in that light, but he had always looked upon it from a business point of view as a sort of justification for taking that course to enable bankers to supply the urgent requirements of commerce. Apparently he stood corrected. Referring to the table contained in Professor Nicholson's paper giving the quarterly averages of issues of currency and those of the index numbers for prices given by the *Economist* and *Statist*, the speaker stated that by allowing a quarter to elapse after the issue of notes, Professor Nicholson showed that the two lines ran together, namely, the index numbers for prices ran with the increased currency. That was the basis for Professor Nicholson's concluding remarks that had been commented upon by two speakers. Professor Nicholson, he thought, agreed with most people and certainly with him (the speaker) that the rise and fall in nominal value of bank deposits, cheques, and bills of exchange, have not the same influence as issues of currency notes which stood on a different basis in some respects. But he thought everyone would admit that to some extent the bank deposit must rise with the currency, because anyone who deposited money in the banks might do so for a special purpose and a nominal amount would depend more or less on prices. The only question was, to what extent? They also knew with regard to bills of exchange that if prices were higher, the nominal amount of the bills of exchange must be higher and in the aggregate would be higher. When they came to cheques, any one who drew a cheque would fix the amount according to the prices, whatever the prices might be, whether of wages or of anything he was buying. But with regard to cheques they stood on rather a different basis from the other two; and the chief reason for making his present remarks was not to argue that the cheque rose with the increase of currency in the manner he had just indicated, but to point out that it had an indirect effect on the currency in inflating it, which the bill of exchange and the bank deposit had not. The conclusion he had arrived at after looking through Professor Nicholson's paper, which gave a better basis for discussion than he had hitherto seen for bringing theoretical questions to a point, was that they might take it that, as a general rule, whether during this war time or in former times, the use of cheques might be considered to raise the general level of prices one-fourth to one-third higher than they would otherwise be and were inflating the currency to that extent.[1] But a very important point which had to be borne in mind and had been very ably put forward that evening, was that they must look round the world to see what was going on in order to arrive at a conclusion as to the effect their own currency was having on prices.

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[1] In the quantitative theory of money and prices, let P represent the average level of prices, Q the quantity of money, and W the work to be done by money. I wish to point out that cheques are not directly included in Q (the quantity of money), but in W (the work to be done by money). And also that though their nominal amount is determined by the quantity of money, they indirectly influence prices by decreasing the amount of W (the work to be done by money). Professor Nicholson's figure of 16 400,000,000*l.* for the Clearing House returns in the year 1913 gives less (even including bills of exchange) than 50,000,000*l.* in reduction of the work at any one time to be done by money, thus having indirectly the same effect on prices as that amount of legal tender money.

Mr. Rüffer said he was only present as a visitor, but as a business man he would suggest that the meeting should not separate without taking some steps towards the formation of an international committee.

The Chairman said that he would put the proposal for the formation of some sort of committee before the Council at the next meeting. He could not say that he felt very hopeful of anything coming of it. In the first place all the active members of the Society were very busy on public work and it would be very difficult to get them together. If they could get together a small academic committee to consider those points which would certainly want considering and clearing up, he thought that would be about all. It was not very easy among our fellows to find men who could be considered experts in those particular questions, particularly at this time; and he imagined that they would have to go to the City and to outside economists to get together a committee which would carry weight, so that he did not think it would be a specially proper piece of work for the Royal Statistical Society to take up. He felt strongly in sympathy with the idea of a very small body of men getting together and discussing these things and collecting the facts, but, as he had said, he felt very doubtful whether the Council would see their way to it. In conclusion he thought they had had a very interesting sequel to the discussion of last week, which had shown that it had been quite necessary to meet again.

The following Candidates were elected Fellows of the Society:—

Leon Isserlis, B.A.
Geoffrey Marks, F.I.A.
Leonard J. Reid, M.A.
Lieut.-Col. Louis Tebutt.

Reply to the Adjourned Discussion by Professor Nicholson.

I have read carefully the reports of the speeches in the adjourned discussion. They are directed principally against the omissions of the Paper. It is suggested that I ought to have considered world prices. Mr. Faithfull Begg said that my method was faulty because of the limited area of the figures dealt with. In my opinion to begin with world prices in dealing with the problem of inflation would be like beginning to build a house from the top. The effect of the great war on world prices can only be understood by taking the principal nations separately, and above all by considering the *order in time* of the rise in prices. I have written a good deal on monetary questions for many years and I doubt if any writer has laid more stress than myself on the interaction of international prices. Under normal conditions the prices of the great staples of international trade, expressed with reference to gold, tend to equality after allowing for impediments of distribution. In a world war this tendency to equality is overpowered by the impediments. Accordingly there arise greater differences in national prices, even when expressed in terms of gold. These differences are greatly intensified by the changes in the monetary systems of the different nations. All the great belligerents adopted directly or indirectly, openly or tacitly, the method of inconvertibility. That is to say, their national currencies were no longer directly related to gold as before the war. In the United Kingdom special efforts were made to maintain the gold par with the United States, and except for a short period *specific* depreciation of the pound sterling relative to the dollar was prevented (having regard to the new specie points). But the *general* depreciation of the pound sterling was not prevented, and there was a continuous fall in its purchasing power, until now in the United Kindgom it is less than one half of the pre-war period. The problem of my Paper was to consider how far this local or national fall in purchasing power or rise in prices in the United Kingdom was connected with the inflation of currency and credit. The first task then was to estimate the inflation in its different forms. For this purpose it was necessary to compare the rates of increase in the war with the rates of increase in the pre-war period. The next step was to make a similar inquiry as to the rise in prices. The final step was to consider what connection, if any, there was between the two movements. Two alternatives are suggested both by theory and by the consideration of the Napoleonic war period and other cases. It may be argued that a rise of prices took place first of all owing to rise in demand and shortage of supply, and that to meet the rise in prices more currency of the various kinds was required. The other alternative is that the inflation of currency and credit resting on it, raised general prices in accord with the quantity theory of money (as interpreted relatively to the local conditions). In deciding between these alternative explanations, the test applied by Tooke of the order in time is of great importance. Evidence was adduced to show that the inflation preceded and did not follow the rise in prices.

Such in brief outline was the scope of my argument, and I regret that I found it impossible to compress into one Paper all the points mentioned in the printed synopsis circulated before the meeting. In the synopsis one item was the comparative rise in prices in other countries. The idea was to consider the order in time of the rise in prices in different countries to see how far the rise in the United Kingdom could be attributed to a rise reflected from other countries. In the Paper itself this was reduced to a single reference to the United States, which was apparently misunderstood owing to its brevity. The expression "relative stability" in the United States was meant to indicate that prices there had not moved so soon or so rapidly as in this country. Of the fact there can be no question.[2]

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[2] *Cf.* Report of Committee of British Association (1916) in *Labour Finance and the War* (1916), p. 242.

It was not till 1916 that there was any marked movement in general prices in the United States. For September, 1915, the index number was the same as for September, 1913. In December. 1915, there was a rise of 5 per cent. only, but by that time the *Statist* index number for the United Kingdom had risen 42 per cent. The comparative reports in the *Labour Gazette* show similar results. Even in the latest number (July, 1917) retail prices in U.S.A. have only risen 41 per cent. as against our 104.

Another item in the synopsis, considered in the Paper in one sentence only, was the reference to loans and taxation. I much regret the enforced omission of this topic to which justice could not be done in the time. A good many people argue that our national rise in prices is not due to any local inflation, but to the payment of our war expenses by loans instead of by revenue from taxation. In my view the raising of the greater part of our loans has only been possible through inflation. A relatively small part has been obtained from the actual savings or economies of the people. The ease with which money and credit could be manufactured removed the natural restraints on public extravagance. The consequence is that the national debt is far greater than it would have been because the extravagance has been greater, and also the rise in prices has been greater. Another of the omitted items was the reference to the changes in the distribution of the national income due to the inflation and (on my view) the consequent rise in prices. It is now being recognized that this is one of the chief causes of the industrial unrest.

Of course it may be said that I could have found room for these neglected items by leaving out matter of less practical importance. I confess that in the selection of topics I was obsessed with the idea that a Paper read before the Royal Statistical Society should deal with statistics, and I imagined that in war-time any excursus into quasi-political criticism, and in particular any reference which might seem in the most remote manner to reflect on the management of British credit, would be promptly deleted by the Council or its appointed Censor. I learned from the opening speech of Mr. Withers that the Society had not found it necessary or desirable to impose restraints on the freedom of discussion. Had I only realized beforehand the extent of this laudable freedom I feel that I might have added a certain liveliness to my solid argument. I recall with regret the words of the old poet—

> Poets lose half the praise they would have got
> Were it but known what they discreetly blot.

On the other hand, the correctness of my severely judicial attitude seems confirmed by the perturbation excited in the mind of one of my critics by the moral of my last sentence in spite of its oracular ambiguity.

In conclusion I may allude to the difficulty in obtaining not only official statistics but even correct information as to existing practice. One of the most serious symptoms of our financial difficulty is the growth of the adverse balance of trade, but the real magnitude of the balance is obscured because the relative governmental transactions are not published.[3] Another vital point is as to the precise conditions under which the currency notes are issued and the degree of their *de facto* convertibility. It is remarkable that at a meeting of this Society in the middle of London opposite views should be expressed by different speakers on these important matters. Apparently, as regards Bank of England notes (and the note issues of other banks), the Acts of 1844 and 1845 are still technically observed both as regards the limitation of issues and convertibility, but the case of the currency notes is quite different. From the statistical standpoint, however, it is satisfactory that weekly returns are issued of the currency note issues and withdrawals. The failure of official statistics in the period of the war is specially noticeable as regards the wages of labour. The returns given by the Labour Department of the Board of Trade are confessedly imperfect. I was unable to get even an approximate continuation of the official index number during the war to compare with former years.

Various interesting points of detail were raised in the discussion which cannot be profitably dealt with in the limits of this reply. In the self-imposed restrictions on the present Paper I was guided partly by what I had already published on different aspects of the subject. The President kindly suggested to me that in my reply I should give references to these other writings. In compliance with this request I may mention that besides the systematic treatment in *Money and Monetary Problems* and in the *Principles of Political Economy*, Vols. II and III of the principal theories, from the beginning of the war I have taken an active part in the controversy arising out of the financial policy of the Government. I may refer first to the article on the "Abandonment of the Gold Standard," published in the *Quarterly Review* for April, 1915 (and written for the December, 1914, number), in which I venture to say that the course of the inflation that has actually taken place was correctly foretold. I may refer next to the series of occasional articles which I was privileged to publish from the beginning of the war in the *Scotsman*, over my signature, with no restrictions of any kind imposed on the expression of my opinions.

The immediate forerunner of the present Paper, however, was an essay in the *Economic Journal* (December, 1916) on "Inflation and the Rise in Prices." For the *Annalist*, of New York, March 6, 1916, I wrote a paper on the "Economic Position of the British Empire after the War," and in the July, 1917, number of the *Scottish Historical Review* I gave a short account of Trade after the Napoleonic War, with some comparison with present conditions. I hope to publish shortly a selection of these Papers.[4]

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[3] These are included in the July, 1917, returns.

[4] Under the title of "War Finance." (P. S. King and Son.)

NOTE ON THE BIRTH- AND DEATH-RATES IN VARIOUS PARTS OF ENGLAND AND WALES IN 1915.

By THOMAS A. WELTON, F.C.A.

MY principal object in drawing up this note has been to supply tables showing the effect of classifying localities under their respective industrial or other characteristics.

The figures for the year compare thus with those for 1913 :—

Births, 1913	881,890, equal to	23·89	per 1,000
,, 1915	814,614, ,,	22·04	,,
Deaths, 1913	501,975, ,,	13·68	,,
Civilian deaths, 1915	553,476, ,,	15·65	,,

The ratio of births in 1915 is calculated by the Registrar-General upon the estimated population in the middle of 1914. That of deaths is calculated upon the estimated civilian population in 1915.

In the report for 1913 the death-rates were not only shown as above (crude) but were also given as standardized, with the object of arriving at figures unaffected by the diverse age-constitution found in different populations. In my opinion the standardized rates supplied could not be depended upon, because variations in age-constitution as between 1901 and 1911 were in some important cases very considerable. Yet in my paper printed in the Society's transactions (January, 1916) I made use of the standardized death-rates as being upon the whole decidedly preferable to the crude rates as bases of comparison.

In 1915 standardization was rendered impossible by the separation of the military element from each population. The removal of great but unequal numbers of young and healthy male lives totalling somewhere about 2,000,000[1] necessarily raised the crude death-

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[1] The figures for civilians in 1915 are :—

Ages.	Males.	Females.	Excess of females.
0—15....	5,748,969	5,737,347	11,622*
15—25....	2,095,826	3,488,786	1,392,960
25—35....	2,092,245	3,249,389	1,157,144
35—45....	2,198,370	2,609,632	411,262
45 and upwards ...	3,858,144	4,280,188	422,044
	15,993,554	19,365,342	3,371,788

* Shortage.

rates, and as at the same time there was a material increase in the mortality amongst elderly persons, those places in which the aged are most numerous were placed in a very unfavourable light.

The augmented deaths at the higher ages may shortly be shown thus—

	1913.	1915.	Increase per cent.
Deaths at ages under 5 years	140,957	144,987	2·9
,, 5 and under 50 years	121,572	130,664	7·5
,, 50 years and upwards	242,446	277,825	14·6
Total	504,975	553,476	

TABLE I.—*Summary table.**

Leading occupations.	Estimated population, 1914.	Births.		Estimated civil population, 1915.	Civilian deaths.	
		1915.	Per 1,000.		1915.	Per 1,000.
Coal mining	4,361,698	123,291	28·3	4,186,652	65,464	15·6
Textile manufacturing	3,182,488	59,349	18·6	3,045,832	49·763	16·3
Engineering and metal working	6,744,645	166,116	24·6	6,628,477	109,018	16·4
Commerce and shipping	2,610,696	64,575	24·8	2,528,467	42,141	16·7
Metropolis	7,194.351	159,924	22·2	6,925,305	105,428	15·2
Other industries	2,688,592	57.375	21·3	2,477,700	39,771	16·1
Non-industrial	858,362	16,185	18·9	794,143	13,260	16·7
Residential	2.243.307	37,016	16·5	2,074.403	30,617	14·8
Undefined†	1,089,098	19,332	17·8	1,033,648	15,868	15·3
Rural‡	5,987,447	111,452	18·6	5,664,269	82,142	14·5
	36,960,684	814,614	22·04	35,358,896	553,476	15·65

* The margin of births over deaths, it will be observed, varies between 1·7 in residential and 12·7 in coal mining districts, and is very small in non-industrial and undersized towns as well as in textile manufacturing districts.

† Towns under 5,000 inhabitants, excluding colliery towns.

‡ After deducting colliery and suburban areas.

The next table shows subdivisions of some important lines in the above summary. And it may here be mentioned that further subdivisions, for instance, separation of the larger coalfields, or seats of manufactures, do but confirm the total figures, although they show lower death-rates in the midland colliery districts than elsewhere in similar districts, and lower death-rates in West Yorkshire than in Lancashire.

TABLE II.—*Supplement to summary table.*

	Estimated population, 1914.	Births.		Estimated civil population, 1915.	Civilian deaths.	
		1915.	Per 1,000.		1915.	Per 1,000.
Coal—						
Large towns	832,298	23,598	28·4	785,339	13,383	17·0
5,000 and upwards	1,857,087	53,569	28·8	1,783,770	28,422	15·9
Under 5,000	141,217	3,699	26·2	137,118	2,076	15·1
Rural	1,531,096	42,425	27·7	1,480,425	21,583	14·6
Textile—						
Large towns	2,086,089	39,348	18·9	1,986,956	32,955	16·6
5,000 and upwards	1,096,399	20,001	18·2	1,058,876	16,808	15·9
Engineering—						
Large towns	5,714,476	141.489	24·8	5,629,459	93,257	16·6
5,000 and upwards	1,030,169	24,627	23·9	999,018	15,761	15·8
Commerce—						
Large towns	2,386,787	59,816	25·1	2,316,392	38.959	16·8
5,000 and upwards	223,909	4,759	21·3	212,075	3,182	15·0
Other industries—						
Shoemaking	570,182	11,519	20·2	552,810	8.348	15·1
Metal mining and quarrying	112,874	2,902	25·7	110,537	1,831	16·6
Agriculture	96,497	2,036	21·1	93,677	1,398	14·9
Defence	810,950	16,066	19·8	680,437	11,070	16·3
Various: high birth-rates	336,613	9,201	27·3	321,421	5,814	*18·1
Various: other	761,476	15,651	20·6	718,818	11,310	15·7
Residential—						
Large towns	835,497	13,277	15·9	764,145	12,088	15·8
5,000 and upwards	1,041,689	16,561	15·9	962,585	14,374	14·9
Rural	366,121	7,178	19·6	347,673	4,155	12·0

* The highest death-rates in this group are 18·6 in Widnes (with Runcorn) and 18·5 in Stoke-on-Trent.

TABLE III.—*Classification of local birth-rates.*

	Number of towns, &c.	Birth-rates, 1915.				
		26 and upwards.	23 and under 26.	20 and under 23.	15 and under 20.	Under 15.
Coal mining—						
Large towns	12	9	2	....	1	....
Towns 5,000 and upwards	120	93	17	9	1	....
Towns under 5,000	*14	7	4	3	....	....
Rural districts	*18	7	6	4	1	....
Textile manufacturing—						
Large towns	17	....	....	4	13	....
Towns 5,000 and upwards	78	....	3	12	57	6
Engineering, &c.—						
Large towns	30	12	7	9	2	....
Towns 5,000 and upwards	66	19	15	14	15	3
Commerce and shipping—						
Large towns	8	1	4	2	1	....
Towns 5,000 and upwards	15	1	3	3	7	1
Shoemaking—						
Large towns	3	....	....	2	1	....
Towns, 5,000 and upwards	8	....	....	3	5	....
Metal mining and quarrying—						
Towns 5,000 and upwards	12	6	2	2	2	....
Agriculture—						
Towns 5,000 and upwards	12	....	1	8	3	....
Defence—						
Large towns	3	....	....	3	....	....
Towns 5,000 and upwards	11	....	3	1	5	2
Various industries (with high birth-rates)—						
Large towns	2	2	....	....	....	....
Towns 5,000 and upwards	6	3	3	....	....	....
Various industries (with lower birth-rates)—						
Large towns	6	....	....	6	....	....
Towns 5,000 and upwards	25	....	‡1	9	15	....
Metropolis	1	....	....	1	....	....
Non-industrial—						
Towns 5,000 and upwards	82	....	4	22	53	3
Residential—						
Large towns	11	....	....	....	7	4
Towns 5,000 and upwards	73	....	1	5	39	28
Rural districts	*8	§1	....	3	4	....
Undefined—						
Towns under 5,000	*57	....	1	7	44	5
Rural† ...., ...	*60	....	3	12	44	1
Totals	758	161	80	144	320	53

* County groups.

† Excluding colliery and residential districts.

‡ Northwich (Cheshire).

§ Halesowen district (Worcester).

TABLE IV.—*Classification of local (crude) death-rates.*

	Number of towns, &c.	Death-rates, 1915.				
		19 and upwards.	17 and under 19.	14 and under 17.	11 and under 14.	Under 11.
Coal mining—						
Large towns	12	4	1	6	1	....
Towns 5,000 and upwards ...	120	16	26	54	23	1
Towns under 5,000	*14	....	3	7	4	....
Rural districts	*18	....	....	12	6	....
Textile manufacturing—						
Large towns	17	1	6	9	1	....
Towns 5,000 and upwards	78	5	14	44	14	1
Engineering, etc.—						
Large towns	30	3	9	15	3	....
Towns 5,000 and upwards	66	6	13	29	15	3
Commerce and shipping—						
Large towns	8	....	1	7	....	....
Towns 5,000 and upwards	15	1	2	10	2	....
Shoemaking—						
Large towns	3	....	1	2	....	....
Towns 5,000 and upwards	8	....	1	4	2	1
Metal mining and quarrying—						
Towns 5,000 and upwards ..	12	2	5	4	1	....
Agriculture—						
Towns 5,000 and upwards	12	....	2	5	4	1
Defence—						
Large towns	3	....	1	2	....	..
Towns 5,000 and upwards	11	1	2	4	4	....
Various industries (with high birth-rates)—						
Large towns	2	....	2	....	....	....
Towns 5,000 and upwards	6	....	1	5	....	....
Various industries (with lower birth-rates)—						
Large towns	6	1	....	3	2	....
Towns 5,000 and upwards	25	2	3	18	2	....
Metropolis	1	....	....	1	....	....
Non-industrial—						
Towns 5,000 and upwards	82	12	29	33	7	1
Residential—						
Large towns	11	....	1	8	2	....
Towns 5,000 and upwards	73	2	14	24	24	9
Rural districts	*8	....	....	....	8	....
Undefined—						
Towns under 5,000	*57	6	11	30	10	....
Rural†	*60	....	2	42	16	....
Totals	758	62	150	378	151	17

* County groups.

† Excluding colliery and residential districts.

The summary (Table I) shows that birth-rates ranked in 1915 in the following order, if we subdivide the "other industries" in conformity with Table II :—

	Birth-rate.		Birth-rate.
Coal mining districts	28·3	Shoemaking	20·2
Various industries (with high birth-rates)	27·3	Military and naval	19·8
Metal mining and quarrying	25·7	Non-industrial (5,000 inhabitants and upwards)	18·9
Commerce and shipping	24·8	Rural districts	18·6
Engineering and metal working	24·6	Textile manufacturing	18·6
Metropolis	22·2	Places under 5,000 inhabitants	17·8
Agricultural towns	21·1	Residential places	16·5
Various industries (other)	20·6		

These figures show a general decline in birth-rates, as compared with the figures for 1913, not very unequally distributed. The class of "various industries (with high birth-rates)" includes such places as Stoke-upon-Trent and Prescot, where coal mining is a secondary employment, and others where brick-making, cement and glass working are prominent industries. It would seem that where men lead a hard life, births are least restrained. The Metropolis, as in 1913, does not deviate widely from the national average. The rural districts in certain counties, more "residential" than the rest, give an average of 17·5, but in the remainder the average is 19·0 per thousand.

Similarly ranking the several sections according to their death-rates in 1915, we have :—

	Death-rate.		Death-rate.
Various industries (with high birth-rates)	18·1	Various industries (other)	15·7
Commerce and shipping	16·7	Coal mining	15·6
Non-industrial (5,000 inhabitants and upwards)	16·7	Places under 5,000 inhabitants	15·3
Metal mining and quarrying	16·6	Metropolis	15·2
Engineering and metal working	16·4	Shoemaking	15·1
Textile manufacturing	16·3	Agricultural towns	14·9
Military and naval	16·3	Residential places	14·8
		Rural districts	14·5

Here the most remarkable fact seems to me to be the greatly improved position of the coal-mining districts.

The high (crude) death-rates in non-industrial places compare thus with the 1913 figures as standardized :—

	17 and upwards.	14 and under 17.	11 and under 14.	Under 11.
82 towns in 1913 (standardized)	....	10	47	25
82 towns in 1915 (crude)	41	33	7	1

but I have no doubt as to the effect of due standardization, could we but have the means to effect this operation. These places contained already a high proportion of elderly people ; the removal from their populations of young and healthy men, and the aggravated mortality at high ages, are in my opinion the true causes of such contrasted results.

If we take the rural districts (by counties) collectively (*i.e.*, not separating those districts which contain collieries or are of a residential character) we have the following comparison :—

	17 and upwards.	14 and under 17.	11 and under 14.	Under 11.
61 counties in 1913 (standardized)	....	3	26	32
61 counties in 1915 (crude)	2	41	18	....

The explanation in this case is the same, and if we carry the inquiry into the case of those towns which in 1911 had less than 5,000 inhabitants, we have :—

	17 and upwards.	14 and under 17.	11 and under 14.	Under 11.
414 places in 1913 (standardized)	29	55	181	149
406 places in 1915 (crude)	133	129	107	37

I have investigated the details sufficiently to assure myself that the great majority of these small places where the crude death-rate was as high as 19 per thousand in 1915 showed much lower death-rates in 1913, and must be regarded as cases of accidental divergence from a moderate average. For the rest the explanation is the same as before, based upon normally high proportions of old people, the elimination of healthy young men, and the unusually heavy death-rates at the higher ages.

It only remains for me to show the larger places in which, in 1915, the crude death-rate was as high as 19 per thousand, comparing this with the *crude* death-rate in 1913 within the same areas :—

	Death-rate.	
	1913.	1915.
Large towns.		
Middlesbro	18·0	22·1
South Shields....	17·8	20·0
Sunderland	17·1	19·8
*Wigan	19·0	19·5
*Leigh	18·1	19·5
Carlisle	14·9	19·4
Ashton-under-Lyne	16·7	19·1
*St. Helens	19·0	19·1
*Merthyr Tydfil	13·6	19·0
Towns 5,000 and upwards.		
*Whitehaven	17·1	24·4
Leighton Buzzard	10·4	23·7
*Golborne	15·1	23·6
*Durham	16·6	23·3
Ripon	13·4	22·9
Ryde	14·7	22·3
Carnarvon	17·3	22·2
Denbigh	13·1	22·1
Abergavenny....	16·4	21·8
Eston	17·2	21·4
*Royston	18·4	21·3
Sudbury	10·9	21·3
Bangor	14·2	21·2
*Rhymney	13·0	21·1
*Morpeth	17·3	21·0
Berwick-on-Tweed	16·1	20·9
Alnwick	15·2	20·9
Penzance	15·2	20·9
Bridport	18·1	20·5
Workington	13·4	20·5
Bilston	19·8	20·4
*Whitwood	23·8	20·2
Heckmondwike	17·5	20·1
Chichester	13·0	20·1
Stalybridge	18·3	20·0
Tipton	16·8	20·0
Flint	20·1	20·0
Arlecdon	13·4	20·0
*Pontefract	14·3	19·9
Consett	16·9	19·9
Louth	15·7	19·9
Aberystwith	12·5	19·9
*Houghton-le-Spring	16·9	19·8
†Cheriton	8·7	19·7
Tilbury	11·6	19·6
*Brandon and Byshottles	16·6	19·3
*Bishop Auckland	15·3	19·3
Stroud	12·7	19·3
Deal	13·3	19·3
*Cudworth	14·7	19·2
*Upholland	15·2	19·2
*Hindley....	17·7	19·1
Hyde	15·6	19·1
Hexham	12·4	19·1
*Felling	15·6	19·0
*Haydock	15·4	19·0
Festiniog	15·7	19·0

* Colliery towns. † Includes Shorncliffe Camp.

ASCERTAINMENT OF MEAN POPULATION FROM CENSUS RETURNS.

By A. T. TRAVERSI, A.I.A.

1. My paper on page 84 has been the means, through the agency of your correspondent's interesting note, of bringing forward Mr. Waters's paper (page cxxxii, Registrar-General's 70th Annual Report) containing his second formula, the existence of which was unknown to me. It would be a pity if a custom grew up of burying these contributions to science in Departmental Reports. Mr. Waters's paper deserved a better fate.

2. Your correspondent, while admitting the accuracy of the formula illustrated in my paper, points out that Waters's formula has advantages over it in the way of facility when applied to a case where there is a multitude of subdivisions.

Here I wish to draw attention to the fact that paragraph 7 of my paper pointed to three methods, ranging from extreme accuracy to extreme facility. All three methods were superior in accuracy to Mr. Waters's first formula, but the middle formula, while admittedly not the most facile, was chosen from the three as being the one suitable for the case I had in view. As this was a case where there were no subdivisions other than the quinquennial age groups, and consequently the calculations of the years of life was an affair of a few minutes only, there was no reason whatever why any but a perfectly accurate and reliable formula should be used; and as Waters's first formula, apparently the only one available, did not fulfil these conditions, I was led to devise one which would. The method was put forward in view of the total absence of any other published formula enabling those desiring great accuracy to secure it.

In this connection it must not be overlooked that, however negligible in the course of ordinary routine a theoretical error may be, there are occasions when it is of very great convenience in the critical examination of subsequent processes to be able to rely upon having placed our initial operations upon a precise basis free from any perhaps half understood vagaries.

3. The third method indicated in the same paragraph of my paper was offered to those desiring greater facility. Regarding it, I said:—

"Others would prefer the less scientific quantity $i'\pi_1$ ($=\pi_2-\pi_1$)
"on account of its greater simplicity. The latter method would
"be open to the theoretical objection that it would be liable to
"give a result falling below the true G.M. at some individual age."

The method thus sketched out is precisely Waters's second formula in different guise, arrived at by an independent chain of reasoning, but not pursued further as being on the face of it not quite so suitable for my purpose, owing to the slight theoretical objection which I correctly pointed out as affecting it. Your correspondent's comparison of my formula with Waters's second formula is, therefore, really a comparison between the second and third formulas given in my paper.

4. Putting it symbolically, the simpler method referred to is expressed in my paper as follows :—

Years of life of age group = (approx.) A.M. $-\frac{\pi_2-\pi_1}{P_2-P_1}P_1\left(\frac{r+1}{2}-\frac{r-1}{\lambda r}\right)$ D

Obviously this may be put

$$=\pi_1+\tfrac{1}{2}I'-I'K$$

(where I' represents the increase in the sectional population (*i.e.*, $\pi_2-\pi_1$) and K is a constant derived from the population as a whole),

$$=\pi_1+I'(\tfrac{1}{2}-K) \qquad \text{E}$$

A simple transformation shows that the constant $(\frac{1}{2}-K)$ equals $\frac{1}{\lambda r}-\frac{1}{r-1}$ which is Waters's second formula factor as reduced by your correspondent.

The principle underlying this, as indicated in my paper, is simply that whilst on the basis of geometrical progression the true mean sectional population (*see* formula C, page 84) is

$$\pi_1\left(1+\frac{i'}{2}-\frac{i'^2}{12}+\frac{i'^3}{24}-\frac{19i'^4}{720}+\ .\ .\ .\ \right) \qquad \text{F}$$

an approximation adding to agree with the total may be got by taking this to the second term in the bracket (which gives the A.M.) and using as a correction the term $i'\pi_1\left(-\frac{i}{12}+\frac{i^2}{24}-\frac{19i^3}{720}+\ .\ .\ .\ \right)$ G or, in other words, distributing out the total error in the population as a whole in proportion to $i'\pi_1$ or I', the correction coming out as a constant proportion of I'.

5. The formula may now be demonstrated in a more direct manner, and this is the more desirable as Mr. Waters's demonstration places perhaps rather much stress upon the unessential condition $m+n=1$, whilst at the same time not pointedly bringing out the real assumption underlying the formula.

Whatever assumption we like to make regarding the mode of increase, it is self-evident that P_t, the population at any moment, "t" may be expressed as equal to the population at the commencement, plus a proportion of the increase, thus

$$P_t=P_1+x\,(P_2-P_1)=P_1+xI$$

writing I for the increase. Here t and x are, of course, variables and P_1 and I are constants.

In the case of a section of the population this becomes

$$\pi_t = \pi_1 + x'\mathrm{I}' \qquad \text{H}$$

(writing I' for the sectional increase $\pi_2 - \pi_1$).

The formula is arrived at by simply substituting in place of x' in formula H, the quantity x taken from the population as a whole, so that it is assumed

$$\pi_t = \pi_1 + x\mathrm{I}' \qquad \text{J}$$

If now we adopt the hypothesis of geometrical progression whereby $\mathrm{P}_t = \mathrm{P}_1 r^t$ and $\mathrm{P}_2 = \mathrm{P}_1 r$, it is easy to show that

$$x = \frac{r^t - 1}{r - 1} \qquad \text{K}$$

Hence we have :—

$$\text{Years of life in sectional population} = \int_0^1 \pi_t dt = \int_0^1 \left(\pi_1 + \frac{r^t - 1}{r - 1}\mathrm{I}'\right)dt$$

$$= \pi_1 + \mathrm{I}'\left(\frac{1}{\lambda r} - \frac{1}{r - 1}\right) \qquad \text{L}$$

Also,

$$\text{Years of life in whole population} = \mathrm{P}_1 + \mathrm{I}\left(\frac{1}{\lambda r} - \frac{1}{r - 1}\right) \qquad \text{M}$$

Formula L constitutes Mr. Waters's second formula as given by your correspondent, and it would be unconditionally true on the assumption of G.P. were r', the sectional ratio, inserted in place of r.

6. Thus we see that Waters's second formula can be said to be alternatively based upon the assumption that the increase in a section of the population follows, not its own geometrical curve, but that assumed by the increase in the population as a whole ; so that *if all the increases were reduced to a common basis as increases from* 0 *to* 1 *they would pass simultaneously through the same intermediate values.*

7. From formulas F and G, or by putting $r = 1 + i$ in formula L, we have

$$\text{Waters's formula} = \pi_1 + \mathrm{I}'\left(\frac{1}{2} - \frac{i}{12} + \frac{i^2}{24} - \frac{19i^3}{720} + \ . \ . \ .\right) \qquad \text{N}$$

$$\text{Whilst true G.P.} = \pi_1 + \mathrm{I}'\left(\frac{1}{2} - \frac{i'}{12} + \frac{i'^2}{24} - \frac{19i'^3}{720} + \ . \ . \ .\right) \qquad \text{O}$$

It would be easy to show from this that if i and i' are both positive or both negative, Waters's second formula cannot exceed A.P., but that it will fall below G.P. if i exceed i' ; also, that if I' and i' are negative whilst i is positive, the formula will always exceed the A.M., with which your correspondent's deduction, with a little interpretation, agrees.

The following table of the values of the factor will, however, prove of more practical interest :—

Value of r.	Value of factor $\left(\frac{1}{\lambda r} - \frac{1}{r-1}\right)$.	Value of r.	Value of factor $\left(\frac{1}{\lambda r} - \frac{1}{r-1}\right)$.
2·0	·442,695,0	1·0	Limiting value = ·500,000,0
1·6	·460,976,2	·9	·508,780,4
1·4	·472,014,1	·8	·518,579,3
1·2	·484,818,1	·6	·542,384,4
1·1	·492,055,0	·4	·575,310,0

These values give us a concrete idea of the effect of the formula. If, for instance, $r = 1\cdot 6$ and $r' = 1\cdot 1$, then the effect of the formula in substituting r for r' is to produce a result falling below G.P. by $I' \times \cdot 03$ approximately. Your correspondent's example on page 90 contains an instance of a result falling below G.P.; a slight theoretical blemish he has apparently overlooked. It must be noted in favour of the formula, however, that provided r and r' are both greater than unity (*i.e.*, if I and I' are of the same sign) the instances where the results fall below G.P. are precisely those cases where the increase in the population is relatively small.

8. Touching the case where one section of the population shows a decrease, your correspondent has misquoted me. I did not make a suggestion that "the movement of the population as a whole might be regarded as consisting of two separate progressions in different directions, each to be dealt with separately." I said that the "circumstances suggest that the logical course would be to regard the movement, &c." I wished to make the point that the employment of formulas based upon the movement of the population as a whole is illogical under these circumstances, and your correspondent offers nothing to controvert this fact. I refrain from blaming the formula for defective results following its illogical use. I may, however, point out that in the case where the population as a whole shows no increase and $r = 1$, the factor $\left(\frac{1}{\lambda r} - \frac{1}{r-1}\right)$, if employed, should evidently be taken as equal to $\cdot 5$, which is its limiting value as r diminishes. It should not be taken as equal to zero.

9. The question of the correctness or otherwise of the theory of geometrical progression as applied to population increases has not been touched upon in these communications.

Taking that theory as assumed, however, operators will now not only have the choice between methods giving the extremes of accuracy and of facility, but it is hoped have also before them the means of seeing precisely where the results fall.

REPORT OF THE COUNCIL

For the FINANCIAL YEAR *ended December* 31, 1916, *and for the* SESSIONAL YEAR *ending June* 19, 1917, *presented at the* EIGHTY-THIRD ANNUAL GENERAL MEETING *of the* ROYAL STATISTICAL SOCIETY, *held at the Society's Rooms*, 9, *Adelphi Terrace, Strand, London, W.C.* 2, *on June* 19, 1917.

THE Council have the honour to submit their Eighty-third Annual Report.

The roll of Fellows on December 31 last, as compared with the average of the previous ten years, was as follows :—

Particulars.	1916.	Average of the previous Ten Years.
Number of Fellows on December 31	758	844
Life Fellows included in the above	163	171
Number lost by death, withdrawal, or default	48	57
New Fellows elected	34	43

Since January 1 last, 15 new Fellows have been elected or restored to the list, and the Society has lost 31 by death, resignation, or default, so that the number on the list, excluding Honorary Fellows, on June 19, 1917, is 742, a decrease of 27 over the previous sessional year.

Since June last year the Society has lost by death the undermentioned Fellows :—

		Date of Election.
c d	Ackland, Thomas G., F.I.A.	1888
	*Allerton, Right Hon. Lord	1880
d	*Aves, Ernest, M.A.	1893

* Life Fellow.
c Member of the Council.
d Donor to the Library.

		Date of Election.
	Bailey, Walter	1907
c d p	Booth, Right Hon. Charles, D.C.L., D.Sc., F.R.S.	1885
	Campbell-Colquhoun, Rev. John E.	1879
d	Cook, Arthur J., A.I.A., M.J.I.	1911
	Debenham, Frank	1880
	Frankland, Frederick W., F.I.A.	1887
	Hamilton, William R.	1913
	Keeling, Frederic H. (Killed in action.)	1914
d	Latham, Baldwin, M.I.C.E.	1885
	*Liberty, Sir Arthur	1888
	Lucas, The Right Hon. Lord	1912
	McCankie, James	1888
c d p	*Martin, Sir Richard Biddulph, Bart.	1872
c	Mowbray, Sir Robert G. C., Bart.	1886
	Muller, Osvald V., M.A.	1905
	*Peace, Sir Walter, K.C.M.G., I.S.O.	1884
c	Pownall, George H.	1913
c d p	Probyn, Sir Lesley, K.C.V.O.	1887
	Rothschild, Leopold de	1889
	Rüffer, Sir Armand, K.C.M.G., M.A., M.D., &c.	1890
d p	Seyd, Ernest J. F.	1886
	Webb, Henry B.	1888
	Williams, F. Bessant, F.S.A.	1864
c d p	Yerburgh, Robert A., M.P.	1886

Honorary Fellow.

d	Waxweiler, Emile	1904

* Life Fellow.
c Member of Council.
d Donor to the Library.
p Contributed a Paper to the Society's Transactions.

The death roll during the past year has been an unusually heavy one, and it includes the names of several Fellows who have been intimately associated with the Society's activities and progress.

The President, Sir Bernard Mallet, in his opening address in November last spoke with high appreciation of their services on behalf of statistical enquiry, and deplored the loss which the Society had sustained by their deaths.

Since November, the death of the Rt. Hon. Charles Booth has deprived the Society of one of its most distinguished members, while the deaths of Mr. Ernest Aves, Mr. Frank Debenham and Mr. G. H. Pownall have, in addition to others, been recorded with deep regret.

Since June, 1916, the following new Fellows have been elected:—

Birkett, Matthew S.
Brand, Hon. Robert Henry, C.M.G.
Broadbent, Arthur Cecil.
Cope, Ralph.
Coutts, C. R. V., F.I.A.
Davies, Joseph.
Eastwood, Hon. B.
Harman, Martin Coles.
Hastings, Hugh.
Heyking, Baron Alphonse.
Isserlis, Leon, B.A., D.Sc.
Jackson, Right Hon. F. Huth.
Jathar, Ganesh B.
Mackay, John.
Marks, Geoffrey, F.I.A.
Marquis, F. James.
Michell, Humfrey.
Mitra, Jagesh C.
Polwarth, J. Bruce.
Pringle, Rev. J. C., M.A.
Rawlley, Ratan C.
Reeves, Hugh.
Reid, Leonard John, M.A.
Richards, Robert.
Tebutt, Lieut.-Colonel Louis.
Wattal, Pyare K., M.A.

The list of elections, though a short one, is somewhat longer than the record of new Fellows elected in the preceding year, and, as stated last year, it was to be expected that the war would cause an increase in the resignations and a decrease in the average number of new Fellows elected. The Council appeal, however, to the Fellows to aid in maintaining the strength and efficiency of the Society by inducing suitable persons to join its ranks.

The expenditure on salaries and wages has been increased from 480*l.* to 492*l.*; the expenditure on the *Journal* from 448*l.* to 507*l.*, due largely to the price of paper; miscellaneous expenses, on the other hand, have been reduced from 301*l.* to 246*l.* The Society has notwithstanding been able to close the year with a credit balance of 328*l.* It should be stated, however, that owing to the stress of other work the expenditure on the Library, more especially on binding, has been less than was intended, and it must be remembered that on the conclusion of the war the liabilities of the Society in respect to salaries will inevitably increase.

A summary of the income and expenditure of the Society for the past twenty-five years will be found in Appendix B.

The thanks of the Council have been tendered to the Auditors for their honorary services.

The absence of the Assistant Secretary, Mr. Kohan, and the Junior Clerk, G. S. Smalley, who are serving with the Army, has again considerably handicapped the work of the office. The *Journal* has again been issued in four parts instead of monthly during the Session, and the offices and Library have been closed at 5 p.m. instead of 7 p.m.

The Ordinary Meetings have been held monthly from November, 1916, to June, 1917, with the exception of May, when no meeting was held owing to the Paper intended to be read on that occasion being unexpectedly delayed in its preparation. The attendance at the meetings has been well up to the average, and the reading of the Papers has been followed by useful and interesting discussions.

The Council regret the delay which has occurred in the issue of the several parts of the *Journal* this session, but the depletion of the office staff and the pressing duties of the Honorary Secretaries in connection with the war have rendered the editorial work exceptionally difficult.

The Papers read before the Society during the Session 1916-17 have been as follows:—

1916.	
I.—November 21	MALLET, Sir Bernard. Presidential Address. The Organisation of Registration in its bearing on Vital Statistics.
II.—December 19	DRAGE, Geoffrey. The Re-organisation of Official Statistics, and a Central Statistical Office.
1917.	
III.—January 16	HEYKING, Baron A. The Economic Resources of Russia, with special reference to British Opportunities.
IV.—February 20	BROWNLEE, Dr. J. The Relation of Infantile Mortality to Mortality in Subsequent Life.
V.—March 20	DUNRAVEN, The Right Hon. the Earl of. How to Improve our Fishing Industries.
VI.—April 17	MANTOUX, Prof. Paul. Trade with France before and after the War.
VII.—June 19	NICHOLSON, Prof. J. Shield, F.B.A. Statistical Aspects of Inflation.

As will be seen, several of the communications, as was the case last Session, have had especial reference to the circumstances of the war. These have aroused considerable interest, as shown by requests in certain cases for their republication in other forms, which have been granted by the Council. The cordial thanks of the Society are due to those who, by the reading of Papers, have maintained, at a high standard, the interest and value of the Society's Proceedings.

The additions to the Society's Library and the use made of it during the twelve months ending May 31, are shown in the statement given in Appendix C. The monthly average of books lent during the year ending May 31, 1917, was 136, and that of borrowers, 42.

The total number of Fellows and others using the Library during the same period was 1,084, or an average of 98 persons per month.

It should be stated that the Library and Records of the Society have again during the past year been largely used by various Government Departments in connection with questions of trade, exchange and finance in relation to the war and of the male populations of the different belligerent powers, and their distribution under present circumstances, the many foreign official and other publications contained in the Library and bearing on these subjects not being available elsewhere.

It is a matter of regret to the Council that books lent to certain Fellows have been retained much beyond the period allowed and in some cases have been lost. This seriously diminishes the value of the Library, and it is hoped that Fellows will abide loyally by the Library Rules. Some of the volumes lost cannot be replaced.

No award of the Howard Medal was made during the year 1916-17, and it has been decided that it shall not be offered for competition in the Session 1917-18. No award of the Guy Medal has been made.

Following the discussion at the Meeting of the Society on December 19, 1916, the Council adopted a resolution favouring the establishment of a Centralized Organisation and control of the Statistical work of the Government, and offering to co-operate in any way that might be possible, should action in this sense be contemplated.

The Council have also agreed to a suggestion from the Institute of Actuaries for reciprocal facilities for reference to books in the Library of this Society and that of the Institute by Fellows of these respective bodies, on the production of a letter of introduction from their Secretaries.

The following Fellows (nominated in accordance with By-law 14) are recommended for election as President, Council, and Officers of the Society for the Session 1917-18:—

PRESIDENT.

Sir Bernard Mallet, K.C.B.

COUNCIL.

*W. M. Acworth, M.A.
Percy Ashley, M.A.
Sir Henry Birchenough, K.C.M.G., M.A.
Edward Bond, M.A.
John Brownlee, M.D., D.Sc.
Professor Sydney J. Chapman, M.A.
*Sir Ernest Clarke.
Sir Timothy A. Coghlan, I.S.O.
Sir Richard F. Crawford, K.C.M.G.
Geoffrey Drage, M.A.
Alfred W. Flux, M.A.
Major Greenwood, M.R.C.S.
William H. Hamer, M.D., F.R.C.P.
*Edgar J. Harper.
Robert Martin Holland, C.B.
John M. Keynes, C.B., M.A.
A. W. Waterlow King, J.P.
Walter T. Layton, M.A.
H. W. Macrosty, M.A.
Sir Shirley F. Murphy, F.R.C.S.
*Sir Arthur Newsholme, K.C.B., M.D.
Sir R. Henry Rew, K.C.B.
*Charles P. Sanger, M.A.
E. C. Snow, M.A., D.Sc.
*J. Calvert Spensley.
J. C. Stamp, D.Sc.
T. H. C. Stevenson, M.D.
Sir James Wilson, K.C.S.I.
Mrs. Frances Wood.
G. Udny Yule, M.A.

Those marked * are proposed as new Members of Council.

TREASURER.

Robert Martin Holland, C.B.

HONORARY SECRETARIES.

G. Udny Yule, M.A. A. W. Flux, M.A. T. H. C. Stevenson, M.D.

HONORARY FOREIGN SECRETARY.

Sir R. Henry Rew, K.C.B.

The abstract of the Treasurer's account of receipts and payments, and the estimate of assets and liabilities on December 31, 1916, together with the report of the Auditors on the accounts for the year 1916, are appended.

Signed on behalf of the Council,

BERNARD MALLET,
President.
G. UDNY YULE,
A. W. FLUX, *Hon. Secretaries.*
T. H. C. STEVENSON,

C. M. KOHAN,
Assistant Secretary.

APPENDICES TO ANNUAL REPORT.

A (i).—ABSTRACT *of* RECEIPTS *and* PAYMENTS *for the* YEAR *ended* DECEMBER 31, 1916.

RECEIPTS.

	£	s.	d.	£	s.	d.
Balance in Bank, December 31, 1915	124	14	–			
Balance of Petty Cash	6	12	9			
Balance of Postage Account	1	10	8			
				132	17	5
Dividends on 2,236*l.* 11*s.* 3*d.* Consols, Account A	44	–	8			
Dividends on Consols, 10,527*l.* 12*s.* 3*d.*, Account B	207	5	4			
Dividend on 1,000*l.* G.N.R. Pref. Conv. Ord. Stock	32	15	–			
				284	1	–
Annual Subscriptions:—						
Arrears	98	14	–			
for the year 1916	1,057	4	–			
in Advance	25	4	–			
				1,181	2	–
Compositions				42	–	–
"Journal" Sales				325	4	6
Advertisements in "Journal"				6	15	–
Royal Economic Society. Use of Library				10	–	–
Sale of Duplicates				1	3	–
Total				£1,983	2	11

PAYMENTS.

	£	s.	d.	£	s.	d.
Rent and Taxes:—						
Rent, less Tax	£323	–	–			
Taxes, 1915-16	76	–	–			
Total	399	–	–			
Less Sub-let	25	–	–			
				374	–	–
Fire, Light, and Water				46	19	5
Furniture and Repairs				13	13	1
Salaries, Wages and Pension				491	14	5
"Journal," Printing and Paper	£459	2	11			
,, Shorthand Reporting	23	17	4			
,, Literary Services	24	4	6			
				507	4	9
Ordinary Meeting Expenses	12	10	10			
Advertising	15	7	3			
Postage and delivery of "Journals"	28	4	5			
				56	2	6
Stationery and Sundry Printing	39	18	11			
New Typewriter	22	6	6			
Library	35	14	7			
Miscellaneous Expenses	67	8	5			
				165	8	5
				1,655	2	7
Balance at Bank, December 31, 1916	319	10	3			
Balance of Petty Cash	8	1	7			
,, Postage Account	–	8	6			
				328	–	4
Total				£1,983	2	11

(Signed) "S. CHAPMAN,
"J. C. STAMP,
"J. CALVERT SPENSLEY, } *Auditors.*

"*February* 7, 1917."

A (ii).—ESTIMATE *of* ASSETS *and* LIABILITIES *on* DECEMBER 31, 1916.

LIABILITIES.

	£	s.	d.	£	s.	d.
Miscellaneous Accounts, as per list...	141	10	–			
12 Subscriptions received in advance...	25	4	–			
				166	14	–
Balance in favour of the Society (Exclusive of (1) Books in the Library; (2) Journals in Stock; and (3) Pictures, Furniture and Fixtures)				8,020	17	9
				£8,187	11	9

ASSETS.

	£	s.	d.	£	s.	d.
Cash Balances	328	–	4			
				328	–	4
2,236*l.* 11*s.* 3*d.* Consols (General Fund). (Price, December 31, 1916, 55¼*l.*)	1,235	13	10			
10,527*l.* 12*s.* 3*d.* Consols (Guy Bequest). (Price, December 31, 1916, 55¼*l.*)	5,816	10	1			
1,000*l.* G.N.R. Preferred Converted Ordinary Stock. (Price, December 31, 1916, 65*l.*) ...	650	–	–			
				7,702	3	11
Arrears of Subscriptions recoverable (say 25)	52	10	–			
Legacy of the late Sir Lesley Probyn	100	–	–			
Sundry debtors	4	17	6			
				157	7	6
				£8,187	11	9

A (iii).—BUILDING FUND (ESTABLISHED *July* 10, 1873): STATEMENT *of the* FUND *on* DECEMBER 31, 1916.

This Fund is invested in Metropolitan Consolidated 3*l.* 10*s.* per Cent. Stock. On December 31, 1915, the Fund was represented by 601*l.* 10*s.* 2*d.* of that Stock. With the dividends received during 1916, additional Stock to the value of 18*l.* 11*s.* 1*d.* was purchased by the Bank of England for the Society. Accordingly, on December 31, 1916, the total investment amounted to 620*l.* 1*s.* 3*d.* Stock.

(Signed) "S. CHAPMAN,
"J. C. STAMP,
"J. CALVERT SPENSLEY, } *Auditors.*

"*February* 7, 1917."

(iv).—"REPORT OF THE AUDITORS FOR 1916.

"*The Auditors appointed to examine the Treasurer's Accounts for the Year* 1916,

"REPORT:—

"*That they have compared the Entries in the Books with the Vouchers for the same, from January* 1 *to December* 31, 1916, *and find them correct, showing the* RECEIPTS, *including a Balance of* 132*l.* 17*s.* 5*d. from* 1915, *to have been* 1,983*l.* 2*s.* 11*d., and the* PAYMENTS 1,655*l.* 2*s.* 7*d., leaving a balance in favour of the Society of* 328*l.* 0*s.* 4*d. on December* 31, 1916.

"*They have also had laid before them an Estimate of the Assets and Liabilities of the Society at the same date, the* FORMER *amounting to* 8,187*l.* 11*s.* 9*d. and the* LATTER *to* 166*l.* 14*s.* 0*d., leaving an excess of Assets over Liabilities of* 8,020*l.* 17*s.* 9*d.*, EXCLUSIVE *of* (1) *Books in Library;* (2) *Journals, &c., in Stock; and* (3) *Pictures, Furniture, and Fixtures.*

"*They have* VERIFIED *the investments of the Society's General Funds* (2,236*l.* 11*s.* 3*d. Consols and* 1,000*l. G.N.R. Stock*)*; the Guy Bequest* (10,527*l.* 12*s.* 3*d. Consols*)*; the Building Fund* (620*l.* 1*s.* 3*d. Met. Consolidated Three and a half per cent. Stock*), *and also the Bankers' balance* (319*l.* 10*s.* 3*d.*)*; all of which were examined and found correct. The market prices at December* 31, 1916, *have been adopted.*

"*They further find that at the end of the year* 1915 *the number of* FELLOWS *on the list was* 772, *which number was reduced in the course of the year to the extent of* 48, *by Death, Resignation, or Default; and that* 34 *new Fellows were elected or restored to the list, leaving on the list on December* 31, 1916, 758 *Fellows of the Society, of whom* 163 *were compounders.*

(Signed) "S. CHAPMAN,
"J. C. STAMP,
"J. CALVERT SPENSLEY, } *Auditors.*

"*February* 7, 1917."

B.—*Statement of the Condition of the Society in the last Twenty-five Years* 1892-1916.

Year.	Number of Fellows on December 31.	Number of Life Fellows included therein.	Losses during Year by Deaths, &c.	Gains by Election, &c., during Year.	Income from					Expenditure.			Amount Invested on December 31.	Year.
					Annual Subscriptions.	Compositions.	Journal Sales.	Investments and other Sources.	All Sources.	Total.	Of which			
											On Journal.	On Library.		
					£	£	£	£	£	£	£	£	£	
1892....	994	171	70	45	1,634	84	158	104	1,980	1,883[i]	539	94	2,900	1892
'93....	964	176	66	36	1,560	124	128	92	1,904	1,921	578	63	2,900	'93
'94....	933	180	67	36	1,491	105	152	82	1,830	1,904	649	75	2,900	'94
'95....	928	180	59	54	1,468	63	180	82	1,793	1,823[j]	576	56	2,900	'95
'96....	910	181	48	30	1,478	42	168	84	1,772	1,787	571	44	2,900	'96
'97....	892	182	58	40	1,472	145	157	83	1,857	1,986[k]	650	50	2,900	'97
'98....	878	180	57	43	1,451	115	182	105	1,853	1,825	609	55	3,300[l]	'98
'99....	896	181	44	62	1,432	95	167	127	1,821	1,805	564	33	3,300	'99
1900....	923	179	36	63	1,514	21	189	148	1,872	1,817	521	53	3,300	1900
'01....	926	177	49	52	1,464	63	211	129	1,867	1,823	518	42	3,300	'01
'02....	932	177	52	58	1,504	21	255	152	1,932	1,839	543	73	3,300	'02
'03....	939	174	49	56	1,517	84	293	151	2,045	1,875	593	91	3,300	'03
'04....	925	175	58	44	1,407	124	253	152	1,936	1,931[a]	521	92	3,400	'04
'05....	911	178	59	45	1,465	168	220	220	2,073	2,074[m]	665	67	11,975[n]	'05
'06....	891	177	63	43	1,464	82	225	408	2,274[o]	1,988	645	95	11,449	'06
'07....	861	172	63	33	1,363	82	327[q]	408	2,180	2,401[p]	571	87	11,746	'07
'08....	855	170	46	40	1,339	84	254	494[r]	2,171[r]	2,428[s]	602	92	11,920	'08
'09....	825	167	82	52	1,307	84	273	396	2,060	2,369	641	99	12,084	'09
1910....	845	172	37	57	1,304	141	326	974[t]	2,746[t]	2,726[u]	803	74	11,210	1910
'11....	867	174	40	62	1,415	126	308	405	2,255	2,372[v]	721	104	10,875	'11
'12....	854	175	57	44	1,336	105	334	382	2,157	2,174	776	81	10,599	'12
'13....	846	174	61	53	1,331	84	294	399	2,108	2,058	671	79	10,092	'13
'14....	821	169	64	39	1,281	42	271	489[y]	2,083	2,319[x]	813	88	9,528	'14
'15....	772	163	61	12	1,243	63	268	351	1,925	1,803	448	40	8,182	'15
'16....	758	163	48	34	1,181	42	325	302	1,850	1,655	507	36	7,702	'16

[a] Includes purchase of Government stock.

[i] Includes outlay for drainage repairs.

[j] Includes cost of Subject-Index to *Journal*.

[k] Includes cost of doing up interior of premises.

[l] Includes 400*l*. G.N.R. Stock, purchased with Mr. J. Heywood's Legacy of 500*l*.

[m] Includes 100*l*. to International Statistical Congress Fund.

[n] Includes the Guy Bequest. The total invested is now valued at current prices.

[o] Including 126*l*. for sale of books.

[p] Includes purchase of 600*l*. G.N.R. Stock.

[q] Includes special sales.

[r] Includes Sanford Bequest, 100*l*.

[s] Includes 160*l*. for Catalogue and 288*l*. for purchase of Stock.

[t] Includes 500*l*. from sale of Consols and 68*l*. Income-Tax refunded.

[u] Includes 436*l*. for re-decoration of premises, installing electric light and furniture.

[v] Includes 169*l*. for furniture and carpets and "at home" expenses.

[x] Includes 100*l*. to International Statistical Institute.

[y] Includes 100*l*. raised by sale of 134*l*. 14*s*. 9*d*. Consols for the purpose of note x.

C.—*Estimated Numbers of Books Added to the Library and Lent, and Numbers of* **Borrowers** *from the Library in the Sessional* **Years** 1914-15, 1915-16, *and* 1916-17.

Months.	Works Received.*			Books Lent.						Borrowers.			Fellows and Visitors using the Library.					Months.
				1914-15.		1915-16.		1916-17.								Called after 5 p.m. or remained after 5 p.m.		
	1914-15.	1915-16.	1916-17.	Works.	Vols.	Works.	Vols.	Works.	Vols.	1914-15.	1915-16.	1916-17.	1914-15.	1915-16.	1916-17.	1915-16.	1916-17.	
1916.																		1916.
July	700	582	569	85	102	48	86	68	106	50	33	44	81	83	127	—	—	July
August	—	—	—	24	29	40	71	75	200	19	22	29	56	58	68	—	—	August
September	—	—	—	32	41	32	50	58	140	25	22	34	112	67	66	—	—	Sept.
October....	—	—	—	33	39	83	134	70	109	25	40	35	102	91	94	—	—	October
November	—	—	—	40	49	68	78	76	141	28	37	49	92	104	80	—	—	Nov.
December	—	—	—	55	65	66	101	82	138	32	46	51	89	88	95	—	—	Dec.
1917.																		1917.
January ...	197	228	209	39	48	76	139	95	198	22	44	40	71	125	122	—	—	January
February	—	—	—	80	91	66	81	49	84	53	34	34	83	104	105	—	—	February
March	89	88	67	55	74	97	130	71	89	36	60	47	124	128	103	—	—	March
April	—	—	—	53	63	71	127	117	186	35	42	48	119	103	104	—	—	April
May	109	115	73	39	64	116	211	85	110	29	64	53	124	132	120	—	—	May
June	—	—	—	61	89	110	242	—	—	43	62	—	127	151	—	—	—	June
Sessional year....	1,095	1,013	918	596	754	873	1,450	846	1,501	397	506	464	1,180	1,234	1,084	—	—	Sessional year
Monthly average	91	84	76	50	63	73	120	75	136	33	42	42	99	102	98	—	—	Monthly average

* These figures represent the number of works entered during the year, under "Additions to the Library," in the *Journal*, and not the number of separate volumes; they are exclusive of about 200 weekly, monthly, and quarterly periodicals regularly received.

PROCEEDINGS AT THE EIGHTY-THIRD ANNUAL GENERAL MEETING OF THE ROYAL STATISTICAL SOCIETY held on Tuesday, June 19, 1917.

The President, Sir BERNARD MALLET, K.C.B., in the Chair.

THE notice convening the meeting was read.

The PRESIDENT, in moving the adoption of the Report, remarked that he did not think it necessary to go through the Report in detail, but that he would like to mention one or two points. There was, unfortunately, a long list of deaths, some of them of particularly distinguished members, and most of them were mentioned in his Presidential address last November. Since then, however, they had lost the most eminent of all their members, Mr. Charles Booth, and he would draw their attention to the obituary notice which was printed in the January number, written by Mr. Ernest Aves, whose loss they had also to deplore; and also to one on the death of Sir Richard Biddulph Martin, who was so long the Treasurer of the Society. Among the newly elected list of Fellows there were some names of gentlemen who would, he thought, do a great deal to keep up the reputation of the Society; but it was important, in view of the decline in the number of members, that Fellows of the Society generally should do something to induce their present acquaintances, or some one amongst them, to join the Society. Its finances, fortunately, in spite of the slowly declining membership, remained in a relatively satisfactory state, owing to the economies which had been forced upon them since the war, but which, of course, necessarily somewhat restricted the Society's usefulness. In this connection he would like to congratulate the Society upon Mr. R. Martin Holland having accepted the Treasurership, in succession to his uncle. He was sure he would do much to help them in any difficulties that might be before them as regards their finances. He would also congratulate the Society upon the papers which had been read during the last year. The fact that in at least three cases they had had demands for their republication in different forms outside the *Journal*, showed they were appreciated and practically useful. He hoped that in the next session they would have equally good papers, and that Fellows would make suggestions for papers of practical interest. He moved: "That the Report of the Council, the Abstract of Receipts and "Payments, the Estimate of Assets and Liabilities, and the Report "of the Auditors for 1916 be adopted, entered on the minutes and "printed in the *Journal*."

Sir J. ATHELSTANE BAINES, in seconding the motion, said he had much pleasure in associating himself with the remarks made by the President. They deeply regretted the losses they had suffered by the deaths of Fellows, several of whom they had known for many years; and as regards the Society's finances, he thought the Executive of the Society deserved great credit for husbanding the resources of the Society without impairing its usefulness.

The motion was carried unanimously.

The ballot for the election of the President, Council and honorary officers for the session 1917–18 was then taken, and the scrutineers (Mr. F. W. BARTLETT and Mr. J. W. NIXON) reported that they had been unanimously elected.

The HON. SECRETARY having read the list of defaulters, the PRESIDENT declared that they had ceased to be Fellows of the Society.

Mr. H. V. READE, C.B., moved a cordial vote of thanks to the President, Council and officers for their services during the past year, which was seconded by Professor J. SHIELD NICHOLSON and carried unanimously.

The meeting then adjourned.

REVIEWS OF STATISTICAL AND ECONOMIC BOOKS.

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1.—*Scope and Method of Statistics.* By Harald Westergaard, Professor of Social Science at the University of Copenhagen. With comments by Walter P. Willcox and others. [Extract from the Publications of the American Statistical Association for September, 1916.] 119 pp., 8vo. Boston, 1916. Price $1.

Professor Willcox, in introducing this memoir to the American Statistical Association, described the writing as an epitome of the author's mature conclusions and the writer as one who has a peculiar claim to attention. There are two classes of investigators, observed Professor Willcox, the producers of statistical data, mainly Government officials, and the analysts of the results, often trained in the higher mathematics; between whom there is needed a closer co-operation and a more intelligent sympathy with each other's work. "Such a lesson of open-eyed and sympathetic co-operation Professor "Westergaard is pre-eminently qualified to teach." His qualifications are such as to constitute him a good judge, in our judgment, on the question whether the higher mathematics, in particular Probabilities, are useful in statistical investigations. Are those right who hold that verbal and numerical reasoning unassisted by symbols is sufficient? As Dr. Bowley points out in his masterly discussion of this question,* it has a parallel in economic science. Now an economist who recommends some use of mathematics is likely to teach with most authority, if he is known to excel in the received methods of reasoning, those which are sanctioned by the usage of the classical economists. Cambridge furnishes more than one verification of this presumption. Similarly, Professor Westergaard secures attention to his plea for a moderate use of the higher mathematics by exhibiting proficiency in the older and better attested methods of statistical investigation. Thus he well employs the conception of a standard population to test the healthfulness of an occupation, that of the law, for instance—barristers and solicitors. The actual number of deaths, 596, is found to be much smaller than the number, 813, which might be expected if we supposed the mortality of lawyers at each of several age periods to be the same as that of the general population. In the use of this method our author lays claim to some superiority over the English statisticians. In this connection we may refer to his sagacious observations on the use of somewhat indefinite categories like "temperate" or "drunkard" in statistical investigations. Suppose that we are inquiring whether an unfavourable effect of intemperance can be inferred from the mortality of hospital patients suffering from pneumonia. Say that patients with intemperate habits have a death-rate of 40 per cent. as against 30 per cent. the death-rate of the temperate. "If out of 1,000 "patients recorded as drunkards only 900 are really such, whereas "100 ought to have been registered as temperate, and a similar "group of 1,000 temperate patients contains 100 who are really "intemperate, then the observed number of deaths in the former "group would be not 400 but only 360 + 30 = 390, whereas in the "latter group the mortality would be 270 + 40 = 310 instead of 300" (18)*. The difference is still marked, though somewhat reduced. Analogously, even if mistakes were more serious, so long as more are not reported incorrectly than correctly, "we find a difference testi- "fying to an unfavourable effect of intemperance, even if we cannot "measure that effect" (18). With such credentials Professor Westergaard is sure to obtain a hearing for his advocacy of mathematical statistics. He will probably convert old-fashioned statisticians to those tenets of the new doctrine which he teaches with especial emphasis.

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* See reference given below.

There is first the principle of sampling, the use of "representative "statistics" (a phrase which one of the commentators, Mr. Watkins, regards, not without some reason in our opinion, as infelicitous). "In many cases," observes Professor Westergaard, "it is prac- "tically impossible to do without representative statistics . . . "No statistician would think of measuring the whole quantity of "milk yielded by all the cows in the country. It is only necessary to "select a certain number of cows, fairly representative of the whole, "and to test the quantity of milk from these cows on certain days." Similar remarks apply to the production of butter and meat, the amount of timber in a forest, the rates to be charged by insurance offices against the risk of fire. The arguments of the Danish statistician clench the experience of the Norwegian Bureau.

---

* The numerals in brackets throughout this review refer to the pages of Professor Westergaard's Paper.

Another mathematical principle which our author has emphasised is that particularly simple use of the law of error which is appropriate to Bernouilli's theorem, as shown by later writers, especially Laplace.* *Primâ facie*, upon a certain condition, this law would be applicable to "the chief problem in medical statistics, viz., to find whether a "particular method of treatment of a disease is effective. Let the "mortality of patients suffering from the disease be p_2 when treated "with a serum, p_1 when treated without it, and let the numbers of "observations in each case be n_2 and n_1. Then the mean error of "the difference between the frequencies of dying in the two groups "will be $\sqrt{\frac{p_1q_1}{n_1}+\frac{p_2q_2}{n_2}}$; and we can get an approximation by putting the observed relative values instead of p_1 and p_2" (21). If, then, there should be a difference in favour of the treatment by serum between the compared mortalities to the extent of four or five times the mean error, one would be justified in believing in the favourable effect of that treatment. That is, we hasten to add, upon the supposition that the frequency of deaths per 100 or per 1,000 patients is distributed in the same fortuitous fashion as the number of, say, black balls in a sample of 100 or 1,000 balls drawn at random from an urn containing an indefinitely large *mélange* of black and white balls. All this is familiar to the modern student of Probabilities. Our author's special contribution to the subject is to carry on the work of Lexis by discovering new instances in which the law proper to games, the "combinational" dispersion in Lexis' phrase, holds good. Professor Westergaard, indeed, goes so far as to say: "It can be proved that by dividing the observations sooner or later "a marked tendency to the binomial law is revealed in some part "of the observations" (22). He gives a curious illustration from the statistics of divorces in Berlin (1898–1908). While the absolute numbers fluctuate widely, it is found that the percentage of divorces which are between Protestants are remarkably constant, ranging from 78 to 76—"within the limits of the binomial law" (23). Other instances may be found in the author's well-known work on "The Theory of Statistics."† We read with interest in Professor Willcox's introductory remarks that this work has been thoroughly revised and re-written within the quarter of a century since it was published, and is now about to appear in Danish. We join in Professor Willcox's hope that the revised work may be translated into English. Possibly the revised edition would obviate some of the criticisms which we proceed to direct against the epitome which is before us.

While throwing a powerful light on some points of the mathematical theory, this treatise leaves adjacent points in deep darkness. As presented here, the buttresses of statistical science "alternately, "Seem framed of ebon and ivory." Tenets as important as those which are elucidated are either not made prominent, or are explicitly ruled out.

---

* *Cp.* Todhunter, *History of Probabilities*, Art. 993, *et seq.*

† *Die Grundzüge der Theorie der Statistik*, 1890.

We shall first consider an instance of the milder degree of disparagement. In the example just now cited of patients treated by two different methods, it is admitted that Bernouilli's law may not be applicable to the unrefined numbers. But our author's only remedy for this imperfection seems to be "dividing the observations" (22), breaking up the given class into species which separately conform to the binomial law—the theorem of Bernouilli as presented by Laplace. It never seems to have occurred to him that the "physical," as distinguished from the "combinational" distribution, to use Lexis' distinction, may be treated by the law of error. Approaching the case in which the simple formula above quoted is not applicable, he once more employs the law of error of the pure binomial type to prove that a die must be false if in 12,000 trials it gives *sixes* 2,200 times (22). But we require now a less simple type of chance—not the frequency of black balls in a sample taken from a uniform mixture (as in the example above given, identical in principle with the author's instance of tossed dies), but the frequency of black balls in a *composite* sample formed by taking a certain number of balls from each of several urns with balls mixed in different proportions. To find the dispersion pertaining to such a composite sample it is proper to add together the fluctuation (mean square of deviation) of the combinational kind pertaining to each urn and the fluctuation of the physical kind pertaining to the discrepancy of the proportions in the different urns. Consider, for example, Laplace's proposal to calculate the number of inhabitants from the given number of births by means of a ratio between number of births and population based on an examination of birth-rates in several districts. Professor Westergaard says:—"He did not reach the bottom of the problem; he "did not prove that these observations were grouped around a "typical value according to the calculus of probabilities" (10). No doubt Laplace, in his treatment of this problem, made a little mistake—which, we trust, may be said without irreverence, seeing that all writers on Probabilities have made mistakes and big ones, as De Morgan too truly has observed. It was improper to treat the birth-rate presented by the districts which were examined* according to the simple law which we have described as Bernouillian. But the remedy to be applied is not necessarily Professor Westergaard's panacea. As far as we have noticed, his only suggestion would be that "by dividing the observations" (22) we should cut out groups in which the birth-rate would fluctuate according to the Bernouillian law. But it may well be doubted whether such an analysis would be possible in the case proposed. It might involve more trouble than simply to count the people by way of a census. For a rough-and-ready estimate it might be sufficient to find the dispersion presented by the series of departmental birth-rates, empirically from the mean square of deviation. As this method of treating ratios is comprehended as a species in the general method of sampling,* we are perhaps precluded from complaining that the special method has been altogether omitted. Still we think that Professor Westergaard ought to have recognised more distinctly both the distinction between the "combinational" and the "physical" measures of dispersion, and the uses of the latter. He seems to us to have attached an undue importance to the Bernouillian type of rates or ratios.

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* For a fuller exposition of the methods in question see Dr. Bowley's Presidential Address to Section F of the British Association, 1906, published in the *Journal of the Royal Statistical Society* for that year; and the present writer's "Methods of Statistics" in the *Jubilee Volume* of that Journal, 1885.

2. A more definite issue is raised by our author's thesis that "the binomial law is generally a little askew, but for all practical "purposes we may set aside this small difference from the symmetric form" (27). For some practical purposes, no doubt, in particular for the purpose just now proposed, the determination of the probability that a certain deviation of one mean from another with which it is compared might haveoccurred by mere chance. But when the purpose is to exhibit the grouping of the constituents rather than to compare the means, then, we think, it is not well to ignore the "small differences from the symmetric form." We recommend as appropriate to frequency groups that are in the neighbourhood of the normal type—"subnormal" groups as they have been called—that development of the normal law which Poisson found as a second approximation, which Dr. Bowley has employed with success in his elements of statistics and other writings.† The issue brings out our difference with Professor Westergaard. We agree with him in thinking that the higher mathematics may be useful in statistics, if used with moderation. We differ from him in our conception of moderation; we think that he has erred from the golden mean on the side of abstemiousness. In the use of the law of error he stops at the first approximation; we go on to the second approximation. This is not the place to enter into a defence of our position. Suffice it to affirm summarily that the second approximation rests upon the same theoretical basis as the first, and is free from certain practical difficulties which beset the third. So far as to subnormal groupings. As to abnormal frequency groups, the "distributions of quite another "form" (27) to which our author alludes—for example, the Ages of Brides, considered in a recent number of this journal—we suspend judgment where Professor Westergaard expresses a decidedly averse opinion, to wit, "It is not as a rule necessary to know the mathe-"matical formulas of these distributions."

3. Under a third head we attribute a more serious error in defect to our author's treatment of mathematical statistics. We quite agree with Professor Persons in his emphatic disagreement (53) from Professor Westergaard's statement, "The coefficient of correlation

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* *Cp.* Article on "Probability," Section 14, *Encyclopædia Britannica.*

† See in particular the paper contributed by Dr. Bowley, in conjunction with the present writer, to the *Journal of the Royal Statistical Society,* 1902; also "The Measurement of Groups and Series." A course of lectures by A. L. Bowley delivered at the Institute of Actuaries, 1902–3. London: Layton, 1903. Pp. 91. (For private circulation.)

"will tell us nothing which cannot be seen from an inspection of the "original numbers." We protest against the statement that on "the whole the formula of correlation does not introduce any new "principles" (44). It is not too much to say with another of the commentators, Professor West, that the author "is apparently not familiar with the properties of the correlation ratio" (62). We readily admit that there are limits to the use of the principle, especially with respect to quantities not susceptible of exact measurement. It is tenable that the statistics given by Professor Pearson as showing *correlation* between writers in respect of temper had better be treated by methods proper to *contingency*; as Professor Westergaard's manipulation of the statistics may be understood to suggest (50). Even upon that understanding his treatment of the statistics appears to us somewhat defective. We do not, however, much complain of his inability to trace correlation of the Galtonian kind between the degrees of temper—quick, good-natured, sullen—shown by pairs of sisters. But it strikes us with atonishment that he shows no appreciation of the correlation between *physical* characters so splendidly verified by Professor Pearson in the context of those *psychical* statistics on which the critic fastens. Can it properly be said of the Galtonian law of correlation as almost perfectly fulfilled in anthropometric statistics that "it does not introduce any new principle" (44), that "no new results can be found" by using it" ? (52).

The only explanation which we can offer—beyond the simple one suggested by Professor West in the passage above quoted—to account for the limitations in Professor Westergaard's treatment of mathematical statistics, is that he had mainly in view only statistics in the primitive sense of the term, relating to *states*, or more generally social phenomena. But then he ought not to have included in an indiscriminate disparagement Mr. Yule's statistics showing correlation between poor relief and wages and his very striking instance of correlation in *vital* statistics between number of a mother's children and number of her daughter's children (44, 45).

On the whole, so far as Professor Westergaard's treatise is addressed to *statists* in a narrow sense of the term, he deserves praise for showing that even with respect to their comparatively rough calculations the principles of Probabilities may prove useful. He has done well in bringing the philosophy of Laplace down to earth; he would have done better if he had not tried to keep it there.

F.Y.E.

2.—*The Town Labourer*, 1760–1832. By J. L. Hammond and Barbara Hammond. ix. + 346 pp., 8vo. London: Longmans, Green and Co., 1917. Price 10*s*. 6*d*. net.

The general story of the Industrial Revolution had been told authoritatively before this book appeared. Apart from official publications it was given, among other places, in the well-known lectures, with that express title, of Arnold Toynbee, "the ideal "modern representative of the mediæval saint," as he has been termed by Dr. Marshall. More recently, by the help of later, fuller investigation, it was recounted in M. Mantoux's admirable French treatise bearing the same name, and we join heartily with Mr. and Mrs. Hammond in the regret that this book has not received the English translation for which it calls. In what we suppose can be regarded as a companion-volume to their own vivid if biassed description of the unhappy, unjust fate of the English village labourer, printed some years ago, our authors could, we imagine, hardly hope to enhance the sympathetic pathos with which Toynbee invested earlier the sad tale of human suffering in the strange industrial surroundings of 1760 to 1832. Nor can we discover that the appropriate use here made of "new material" "accessible "to students" in the "Home Office Papers" at the Public Record Office has altered the outstanding features of the later more complete survey to which we have referred. It is possible that on a further volume, which is promised, supplying "in detail the history "of the work-people in various industries," the fresh documentary evidence mentioned may exert more considerable and manifest an influence. But we are now prompted to inquire whether this representation, in dark colour, of regrettable episodes that disfigured a "revolutionary" stage of economic change was imperatively demanded; and we confess that the reply, made in the Preface, that the subject has a "direct bearing on problems that are beginning "to engage the attention of the nation as the war draws, however "slowly, to its end," does not satisfy our curiosity and stirs suspicion.

For the difference between the England portrayed in this book, which, with "complacent pessimism," witnessed the misery accompanying the "new civilization" introduced at the end of the eighteenth and the beginning of the nineteenth century, and the comfortable independent life of the great bulk of English artisans in 1914 or 1917 seems to us as great as that which has divided the present prosperous Ireland of land-purchase and agricultural co-operation—the recipient, too, of willing generosity at the lavish hands of the "predominant partner" in the Union—from the past oppression of penal laws and the old unfairness of the Mercantile System, giving to the sister-kingdom worse, and not better, fiscal treatment than that dealt out to other "plantations" placed in the Colonies beyond the seas. The cases seem to us analogous and in both we can discern little justice and some disadvantage or mischief in the meticulous recall of grievances long since redressed. Resentment originally justified by conditions fortunately obsolete is, in our opinion, infelicitously or unfairly roused towards those who can be in no way to blame for the shortcomings or misdeeds of their forefathers.

Apart from the moral we have shown that Mr. and Mrs. Hammond would, as we think, illegitimately extend, they have treated their present study in a mood more scientific than that inspiring their previous narrative of the wrongs done to the village labourer in the same by-gone period. That earlier book indeed appeared to us to furnish an example of history as it should not be written. Its account of inclosure was one-sided. The bias was extreme; and the attitude of the joint authors too pronounced to admit of a sufficient measure of detachment. In the volume now before us little relief is provided to the intense pervading gloom, and it is not inaccurate or unjust to speak of agony as "piled on" agony. But an impersonal system may be said to be held to be more responsible than individuals engaged on its working; and account is taken of the general temper of the times, the influence of which was not confined to economic dislocation and adjustment and did not begin or end with industrial iniquity. In fact the most significant addition these fresh narrators have made to the tale told by their predecessors is the stress laid properly on the tendency of the dominant religious creed, or varieties of creed, to excuse or palliate, or at any rate lend no active countenance to resolute opposition to, some of the most unlovely characteristics of the new social order.

The sublime assurance with which the apparent liberty of individuals to dispose of their own fates in this world, or even of that of others dependent on their control as well, was approved or justified; and the extravagance, which had no firm permanent foundation, of the fashionable philosophy of laissez-faire, accorded with the ruling doctrines and the prominent beliefs of both church and chapel. No discord, but a plausible harmony, was established in the views held and expressed on terrestrial trials and heavenly rewards. And the responsibility for what occurred, or was tolerated, cannot therefore be attributed alone to the mechanical systems of materialistic logic framed by men, who were also in fact humanitarians and reformers in their special sphere, like Bentham and Ricardo, and their friends and followers. Individualism was supreme in economics and in morals, but it was also latent, if it was not revealed, in spiritual concerns; and it was with real difficulty that troubled patriotic statesmen, confronted by the terrible results of unfettered license, could so far emancipate themselves from the current despotism of educated thought and popular opinion as to have recourse, even exceptionally, to the suspected remedy of governmental interference.

This situation has been firmly gripped and is clearly explained and pointedly described by Mr. and Mrs. Hammond, whose literary capacity is remarkable. The story which they tell may, as we have hinted, be familiar; and the events described and the persons limned are not often new. But the tale is forcibly recounted. Scenes and incidents are bitten into the recording plate of the reader's memory with the corroding acid of a mordant temper and a copious eloquence. Although from time to time they admit the existence of exceptions the prevailing type of character is so firmly fixed that it will not be forgotten. Their uncommon capacity indeed for producing readable history is so indisputable that we regret the more any bias associated with its use by such fine craftsmen. The fault, as we have said, is less obviously prevalent in the later than it was in their earlier book. But the cool historian still disappears too frequently behind the rhetorical advocate, and what must be in any event a painful perusal becomes unduly sombre and disheartening. We cannot rest content with the view of perversity or depravity in the upper ranks especially, of the industrial world, between 1760 and 1832 which Mr. and Mrs. Hammond seem resolved to popularize. L.L.P.

3.—*National Economy—An Outline of Public Administration.* By Henry Higgs, C.B. 147 pp., 8vo. Macmillan and Co., Ltd., 1917. Price 3*s.* 6*d.*

The Newmarch Lectures for 1916 here make a timely and useful work. Until recently the literature upon this special subject was scanty indeed. but four volumes have now appeared which cover the ground so thoroughly that a satisfactory view of it is obtainable from almost any angle. Two of those works are mainly a formal presentation and arrangement of important facts and documents; two furnish a more interesting or readable account. The former are the work by Mr. Higgs entitled "The Financial System of the "United Kingdom," and a recently published work by three American University professors (Messrs. W. F. Willoughby, W. W. Willoughby and S. M. Lindsay) acting as a Governmental commission, who visited this country in 1914, full of pertinent questions and skilfully directed curiosity, resulting in a comprehensive work of great critical value. In the more popular category we find Mr. Hilton Young's book and the present volume of lectures. In reviewing Mr. Higgs' previous work it was remarked, rather by way of definition than criticism, that it would hardly serve to awaken interest in the subject on the part of new students, but Mr. Higgs has now made it clear that he can treat his subject in both mediums with equal facility. There is an ease of narration and fulness of illustration about these lectures which make them invaluable for getting a real atmosphere about the somewhat dry questions with which departmental and budgetary finance is generally supposed to deal. There was a criticism of Mr. Young's work in these columns that he was not always extolling the true economy: Mr. Higgs makes his attitude clear from the beginning by a quotation from Burke, "Expense, and great expense, may be "an essential part in true economy . . . mere parsimony is "not economy . . . Economy is a distributive virtue, and "consists not in saving, but in selection." Hence, then, this is no worship of cheese-paring. It stimulates to a high sense of the functions of the private citizen in these studies, for he "owes some-"thing to his country more than his purse. Something more even "than his heart. To serve his generation faithfully he must give "it his brains and not abdicate his fraction of sovereignty." In treating of formal finance, economical organization and business management, the control of expenditure, and of revenue, budget and loan policy, Mr. Higgs is full of wise saws and modern instances, and his lectures will be valuable to many classes of readers.

J.C.S.

4.—*Health and the State.* By William A. Brend, M.A., M.D., B.Sc. xi + 354 pp., cr. 8vo. London: Constable and Co., 1917. Price 10*s.* 6*d.* net.

The purpose of this book is to assess the values of the various factors which can be deemed of prime importance in determining the public health of a state, to show how much success in controlling these factors has already been attained and to indicate necessary reforms. The first four chapters, devoted to the examination of the causes of disease, are chiefly statistical in character and much attention is given to the problems of infant mortality. Dr. Brend has little difficulty in showing that a good deal of exaggeration is to be found in the claims of amateur enthusiasts and even of some "experts" on behalf of this or that sanitary reform as a cause of diminished infant mortality. He himself attaches pre-eminent importance to urbanisation and puts emphasis upon the baleful effects of dust and smoke polluted atmospheres. It is possible that Dr. Brend has been betrayed into some slight exaggeration on this point. Thus, in Germany, which he mentions in another connection as a land of excessive infant mortality, the rural rates are not uniformly lower than the urban rates. In Bavaria, for instance, the rural rate has been higher than that of the towns for the series of years recorded by Prinzing between 1889 and 1902, while the enormous mortalities in the districts of Wurtemberg bordering the Danube (355 per 1,000 in the administrative area of Blaubeuren for 1892–97 is an example) do not refer to highly urbanised communities.

Nevertheless, even Germany, with its appalling loss of infant lives in the mining districts of Saxony, does certainly provide evidence which might be cited by Dr. Brend in support of his thesis, which, if not proved, is plausible. Dr. Brend's protest against the current misuse of statistics is thoroughly justified and we endorse his view that further research, both experimental and statistical, is required. A similar remark applies to the fourth chapter, which usefully summarizes a number of disquieting facts respecting the physical conditions of children of school age, good use being made of the reports of Sir George Newman and of the local school medical officers. Chapter VI is devoted to an account of the unsatisfactory circumstances of medical treatment of the working classes in this country; most medical men who have had any experience in the poorer districts of a great city will find it difficult to dissent from the author's conclusions. The seventh chapter is a vigorous indictment of the genesis and effect of the Insurance Act, while the eighth, especially in the section devoted to food adulteration, records the salient features of the age-long, vigorous and largely unsuccessful campaign waged by the central and local public health authorities against those who find their profit in the systematic poisoning of the public. Dr. Brend remarks that "When we recall that during the War one of "the largest firms of caterers in the country has been fined the "maximum amount for supplying unsound meat to the troops, the "magistrate expressing the opinion that the negligence involved "not only the employees, but also the managers of the firm; and "that another large company was fined the maximum amount for "supplying adulterated butter to troops, we see that patriotism "weighs as little with dishonest traders as concern for Public "Health."

The remainder of the book is devoted to proposals for reconstruction of the public health services. Broadly speaking, Dr. Brend advocates decentralization of the public health administrative services with a good deal of devolution, although retaining some of the central medical departments, for instance, that of the Board of Education, and the creation of a new Ministry of Health charged with few or no administrative duties, and designed to carry out research of a statistical and sociological kind, laboratory research being still entrusted to the Medical Research Committee created under the Insurance Act.

In our judgment, Dr. Brend's book is an extremely valuable contribution to the literature of public health. Many of his criticisms are not novel, several statisticians have reached and expressed equally adverse judgments upon the pseudo-statistical utterances of popular oracles, but we do not recall any writer who has so successfully maintained an impartial attitude and avoided even the suspicion of wounded *amour propre.*

While cordially agreeing with Dr. Brend's diagnosis, we are not so enthusiastic about his treatment. We are sceptical as to the virtues of the proposed Ministry of Health.

By hypothesis, this Ministry is not to be an administrative body, for in this way Dr. Brend hopes to avoid the subordination of the scientific type of mind to the administrative type, a relation which is almost inevitable in any executive unit. It (the Ministry) "is to have no authority, except such as comes from the weight "of its opinion; and no power of issuing orders, except such as are "required for purposes of research and the advancement of know-"ledge." It seems to us that the objects can be better attained by an extension of the field of the existing Medical Research Committee. Thus, the popular prestige of such an organization as the suggested Ministry, regarded as the mouthpiece of scientific thought, cannot be so great as that of, for instance, the Royal Society (probably the one scientific body which the man in the street regards with awe). If, then, it were an obligation upon government departments before taking action in public health matters to apply to the Royal Society for a report, the Society could arrange with the Medical Research Committee the investigation necessary, the Committee selecting the investigators, to whom all the necessary facilities for collecting and analysing statistics should be granted, while the results of their inquiries would go to the department concerned with all the traditional weight appertaining to the leading scientific body in Europe.

It does not, of course, follow that the advice so tendered would be taken, but we suspect that the popular politician would be more chary of disregarding the views of the Royal Society than of ignoring the opinions of an isolated government department.

Whether, whatever system is adopted, there is any likelihood of public administration, central or local, drawing continuous inspiration from scientific thought, is a question which we are not disposed to answer optimistically. So long as the public regard men of science as harmless cranks or, alternatively, witch doctors, their political representatives will do the same. The war has given wider currency to the witch doctor view and modified the harmless crank hypothesis, but no other change is obvious. M.G.

5.—*Profit-sharing in the United States.* By Boris Emmet. Bulletin of the United States Bureau of Labor Statistics. Whole number 208. 188 pp., 8vo. Washington: Government Printing Office. December, 1916.

Profit-sharing as defined by the International Co-operative Congress, held in Paris in 1889, *i.e.*, as confined to plans under which distributions of specified proportions of the net profits of the enterprise are made to at least one-third of the total employed, does not appear to have reached any considerable proportions in the United States. The number of such plans known to be in operation in 1916 did not exceed 60. Over two-thirds of these had been in operation less than ten years, and of these 21, or more than one-third of all, were put into effect in 1914, 1915, and 1916. Full particulars have only been given with regard to 34 establishments with 13,928 workpeople participating in the division of profits.

The Report gives an analysis of 12 typical profit-sharing plans. Of these, the most interesting to English readers is Plan No. 5, described on pp. 37-41, in which a theory advocated by the late Benjamin Jones, but never so far as we have been able to ascertain applied in the United Kingdom, has been adopted. Not capital, but the interest on capital—the "wages of capital"—under this system shares at the same rate per pound as the wages of labour. On p. 14 the results of the two methods are contrasted. Assuming that the total capital invested in an undertaking during a specific year is $500,000, that it is understood that the fair interest on the same is 6 per cent., that the amount paid out in wages is $100,000, and that the amount of available divisible profits is $120,000, the share of labour on the ordinary method (with the ratio of total capital to wages as a basis) would be $20,000, and that of capital $100,000. With the ratio of interest on capital to wages as the basis, the share of labour would be $92,300 and that of capital only $27,700. In the establishment in which the latter system has been adopted 113 out of 161 employees participated in the profits in the last year included in the returns (1914), and received a dividend amounting to 90 per cent. of their earnings. In 1906 the dividend on wages was as high as 120 per cent.

The Report also deals with a selected group of limited profit-sharing plans, the basis of selection being the relatively large (for profit-sharing plans) sphere of application, the greater part of the plans examined extending their benefits to the bulk of the executive, administrative, and supervisory employees, and in some instances also to a part of the higher paid employees of the manufacturing force. In this section the working of five typical limited profit-sharing plans is analysed.

The consideration of various bonus plans, commonly known as profit-sharing, occupies the latter half of the volume, the main interest of the plans described lying in the factors which determine the bonuses to be distributed and the conditions which determine participation. Plan No. 2, described on pp. 94-122, is the most distinctively American, most of the rules and regulations, as well as the results described, concerning chiefly the manual and mechanical workers, many of whom are of foreign birth and unable to speak the English language. "It is the opinion of the Company that the "employees of the commercial and clerical occupations, who mostly "are native Americans with some education, need not be told how "to live decently and respectably." The essential principle guiding the distribution of bonus under this plan is that the largest proportion of earnings is to be given to the lowest paid workers.

C.E.C.

6.—*Economic Conditions*, 1815 *and* 1914. By H. R. Hodges. 91 pp., small 8vo. London: George Allen and Unwin, 1917. Price 2*s*. 6*d*. net.

"In 1815," the author of this little essay, which has won the Reitlinger Prize in the University of London, writes, "the country, "with the rest of Europe, awoke from a nightmare of war." "In "1914, Europe entered into a second and more terrible nightmare, "in which England is more involved than in the previous case." There is therefore an opportuneness in its publication, and in comparisons drawn between the beginning and the end of the eventful century comprised, although the book was written "before the effects "of the war (apart from the confusion at its outbreak) on the national "welfare had begun to be felt, or their significance realised." After an Introduction, the author deals in successive chapters with the four important topics of population, finance, occupations and remuneration. Figures and graphs are, so far as we can judge, correctly handled and appropriately employed; and the running commentary supplied is apt and lucid. In the matter of population, for example, the conclusion is reached that, "while in 1801–11 the "urban population was growing no faster than the rural," from the latter date a "process of urbanisation" began and continued during the century "at a great rate," until at the present day "the propor-"tion of persons in England and Wales living under urban "conditions" is 78 and of those "under rural conditions" 22 per cent., but nevertheless "in places (the most urban areas) urbani-"sation has now reached saturation point." In the final chapter it is declared that to turn from the "great improvements of the "century in the economic condition of the people" to the "actual "achievements" "creates at first a hopeless feeling." That is founded on the comparison between "so much progress and so "little satisfaction." But the answer is that "men compare" their state, "not only with that of their forbears," or their "neigh-

"bours," "but with what might be." With the sane judgment and the sensible discrimination marking his whole essay our author concludes "that for further progress" "no revolutionary changes "will avail" or are "needed," because the "true greatness of the "English nation will be achieved in the English way." Students of the data conveniently collected in the modest compass of this small book are, we think, unlikely to dissent from this temperate opinion. They will discover a sufficient reason in the facts and figures presented on the preceding pages, summarising aptly as they do the history of the new order introduced into Great Britain by the Industrial Revolution which took definite shape after the war against Napoleon had been finished. L.L.P.

7.—*Economic Problems of Peace after War.* By William Robert Scott. xii + 122 pp., 8vo. Cambridge: The University Press, 1917. Price 4*s.* 6*d.* net.

In these Jevons Lectures, given at University College, London, Professor Scott has ventured upon slippery but attractive ground. He joins an eager host of seers busy with large "reconstruction." Yet, as we read his "foreword," he himself refrains from promising "solutions" of the interesting problems here described, examined and elucidated. If he must share at all a common reproach, levelled against prophets, for biassed advocacy of pet schemes, his most conspicuous leaning is adverse to the popular trend and he is not very hopeful of success. He urges earnestly, however, the re-establishment of freedom, which has been seriously, if necessarily, restricted in the last three years through the rise of new, and the development of old, departments of the State. More than once he cogently insists on the peculiar irony of a situation where as the sequel of an enormous effort to safeguard the liberty of peoples the enslavement of individual enterprise by bureaucratic force is contemplated as desirable or likely. He hardly conceals his own personal fear lest, victorious as we shall be in the immediate struggle, we may in important economic matters subsequently concede to baffled Germans the barren triumph of servile imitation of the dubious example they have set in encouraging or discouraging industry and trade.

On the other hand, although he holds instructively that the effects of war may remain, for good as well as ill, in habits permanently transformed or modified, and believes, for example, that economy, taught successfully at last after too long an interval from the beginning of the contest, will continue to be practised when the strong pressure to which it has lately been due has grown less sensible, he discovers in that circumstance, carefully investigated in perhaps the best of the six lectures—the fifth of the series—one among his many reasons for taking on the whole a cheering rather than a dismal horoscope. He sees indeed grave perils and formidable obstacles ahead, but he does not on that account range himself with pessimists, and he supplies substantial fact to justify his happier creed. In this general conclusion, as on some particular details, Dr. Scott is encouragingly positive. But the wise caution with which in other passages he scrupulously states all the balancing considerations that occur to so informed and just an observer may render sections of his book difficult or dull, because they seem inconclusive, to ordinary readers. Despite, indeed, the aptness and variety of the illustrative quotations used, they may, we suspect, find it troublesome to follow some of the elaborated argument, or, failing to remember the connecting links between the different topics handled, they may possibly blame the author's discursiveness for their own confusion. Yet they cannot but be keenly interested in much that is introduced, incidentally as it may sometimes seem. They will note, and recollect, for instance, we feel sure, the fresh opportune comparison drawn in the second lecture between the loss of British ships in the Napoleonic War and that now sustained, and they will welcome the sanguine result which is established.

Economic students on their part, we are no less confident, will appreciate the wealth and pertinence of suggestion, the sagacity and penetration of analysis, and the wide accurate erudition shown. They will follow Dr. Scott, admiringly, as he combats at the commencement the weak view that economics must perforce be suspended during war, as he examines in the following lecture the inadequacy of the conception of "emergency" activity as coterminous with the struggle, as in the fourth chapter he dwells on "surprises of peace" and on the double need of acknowledging "continuity" and admitting "new phenomena," and as, in conclusion, he considers what is described cumbrously, but expressively, as "organisation re-orientated." They will recognise a sense of mastery belonging rightly to a trained historian and an expert economist. They will be conscious that he is alive to the proper use and the hazardous abuse of historical analogies, and is fully aware both of the possibilities and of the limitations of science methodically framed and expounded. That, they will insist, has been employed to good purpose by him in arranging and interpreting a mass of tangled facts suddenly exposed to the disorderly upheaval of an unprecedented war. For explanation, or re-statement, rather than propaganda, or prediction, is the chief aim and laudable intention of this book. Its value therefore is not ephemeral.

L.L.P.

8.—*After-War Problems.* By the Earl of Cromer, Viscount Haldane, the Bishop of Exeter, Professor Alfred Marshall and others. Edited by W. H. Dawson. 366 pp., 8vo. London: George Allen and Unwin, 1917. Price 7*s.* 6*d.* net.

† *The War and the Nation: a Study in Constructive Politics.* By William Cecil Dampier Whetham, F.R.S. x + 312 pp., cr. 8vo. London: John Murray, 1917. Price 6*s.* net.

We are often told that the world will be different after the war from what it was before. Possibly we may do different things, but if we may judge from the numerous "after-war" books which have been published, we shall all say very much the same as we have been saying any time the last ten years, only we shall say it either more loudly or with greater assurance. Mr. Dawson has got together a distinguished company, including besides those mentioned in the title, Bishop Welldon, the Earl of Meath, Sir H. H. Johnston, Sir Joseph Compton-Rickett, Dr. Garnett, Professor Chapman, Mr. G. H. Roberts, the late Sir Benjamin Browne, Mr. Joynson-Hicks, Mrs. Fawcett, Mr. H. R. Aldridge, Dr. James Kerr, Miss Margaret McMillan, Sir William Chance and Mr. Arthur Sherwell, and the doctrine of all of them is just the same as it would have been in the absence of the war, though they take the war as the text of their sermons. Mr. Whetham, too, is unchanged.

It is impossible here to follow all these writers into their respective provinces, and if there were sufficient space, it would be of little use. The probability is that for many years after the war mankind will have too much difficulty in merely living from hand to mouth to be able to give much time to the adoption of well-thought-out and far-reaching schemes of reform. In particular, the difficulties which European States will encounter in making ends meet will tend to push aside all schemes which rely on State assistance, so that the chapters of the books before us, most interesting to the practical man, should be those in which suggestions about public finance occur.

Professor Marshall, writing some time ago—a slip inserted in "After-War Problems" apologises for the delay in publishing the work—estimated the National Debt after the end of the war at three thousand millions, and the revenue required at more than four hundred, "possibly much more." Mr. Whetham, at a later date, puts the debt at five thousand millions and the required revenue at 580,000,000*l.* "if war expenditure ceases by the end of March, 1918." The two estimates agree in allowing only a small increase of peace expenditure on "Defence" (exclusive of war pensions), as the public finance writers of all countries agree to call it. Professor Marshall budgets for some 20,000,000*l.* or 30,000,000*l.* over the pre-war expenditure under this head, and Mr. Whetham gives 50,000,000*l.* as the minimum probable increase under it and "national and imperial development" together. But is not an increase of from 20,000,000*l.* to 50,000,000*l.* about the most improbable of all events in this province? If co-operation between the nations is secured, anything like the old scale of expenditure will be quite out of place and could only lead to the dissolution of the new union, while if international relations return to their old footing, and we are to settle down to prepare for the next war, what we have learnt about preparations for war on land, on sea and in the air, surely suggests a thousand millions as much more likely to be near the mark than a hundred for land, sea, and air offensive and defensive equipment. But the most optimistic view on this point would not cause the reduction of Mr. Whetham's estimate to less than about 500,000,000*l.*, of which 50,000,000*l.* would go to sinking fund. It cannot be said that either Professor Marshall or Mr. Whetham throw much light on the manner in which the money is to be found. Adherents of the doctrine of "least aggregate sacrifice" in taxation will welcome the accession of Professor Marshall to their ranks revealed by his remark that "the hurt caused by obtaining 1,000*l.* of additional revenue by means of levies of 20*l.* from each of fifty incomes of 200*l.*, is unquestionably greater than that caused by taking it from a single income of 10,000*l.*," and parents of large families will relish Mr. Whetham's principle of making each member of a family (up to an unspecified age) count as one for purposes of income-tax, so that, *e.g.*, a man with a wife and two children and 400*l.* a year would be treated as four persons with 100*l.* a year each, and therefore be exempt. But the Treasury, faced by the disappearance of the excess profits tax and probably a huge drop from the war yield of the income-tax when income ceases to be artificially inflated by expenditure from Government borrowings and excessive issues of Treasury notes, will take more interest in positive suggestions for increasing the sums which it is likely to receive. Mr. Whetham is going to get 3,000,000*l.* a year by handing coal mines over to Government management, and something under 7,000,000*l.* a year by substituting postmen for the agents of insurance companies, and he would raise the income-tax, super-tax and excess profits tax (why should there be any excess profits when the war is over?) "if necessary." This is not very helpful. Professor Marshall, while advocating very steep graduation of the income-tax, agrees with Mr. Whetham in desiring allowance to be made for number of persons dependent on each income, and also seems desirous of exempting the parts of incomes which are saved, without noticing that exemption of savings and graduation are in practice opposing principles, inasmuch as the largest incomes are those from which the largest proportion is saved. We can imagine the Treasury saying very emphatically "There is no money in this." Nor is there much money in Professor Marshall's suggestions of "a heavy national inhabited house tax graduated more finely and more steeply than the present" (the rate of which on a house of 61*l.* rent is actually triple what it is on a house of 39*l.*), a tax on servants, graduated according to their number, but exempting one female servant and taxing two only lightly, and making allowances for "number in family," a graduation of motor car taxes according to possible speed rather than horse-power, and the taxation of advertisements. The large houses and the families with more than one or two servants are too few to make it possible to exact much from them; there is nothing at all to be got out of a substitution of speed for horse-power; and, while admitting an advertisement tax to be desirable, we may well doubt whether it could be made to yield very much more than the *affiche* tax in France, though that does not cover all the ground which Professor Marshall has in mind.

Such trifles as these will not provide a means of escape from the real alternatives. On the one hand, very heavy taxation of the necessaries of life, which will make the bulk of the population pay back what they have gained during the war and a great deal more;

and on the other, a drastic assessment on all property (including, of course, holdings of war loans) as recommended by Ricardo, but far easier to carry out in our time than in his. E.C.

9.—*L'Union Commerciale des Alliés après la Guerre.* Par Bernard Lavergne. 77 pp., 8vo. Paris: Félix Alcan, 1917. Price 1 fr. 50 c.

The author of this essay, it is evident, has no doubt of the possibility and advantage of the scheme here propounded for the relations of the Allies with their enemies, with neutral countries, and with each other. It is virtually a reply to the hostile ambition of a "Middle Europe." M. Lavergne leaves open the question whether England will, or will not, adhere to Free Trade policy, although he recognises that her partners in the present struggle, damnified, it might be, by a change, could not reasonably feel aggrieved at her encouragement of inter-Imperial trade. France at least, with her own colonial "assimilation," could not object. Nor at the time of writing had the United States reached the decision to which they have since come. By our author they are regarded as the most considerable of the neutrals. But their entry as belligerents strengthens rather than impairs his argument, while Russia's withdrawal, he has hinted, would confirm and would not invalidate his conclusions. His programme is summarised on the title page where "customs hostilities" towards Austria and Germany are joined with "preferential tariffs" among the Allies.

He contends that the figures of exports, which are, he holds, the prime consideration, and those also of imports, prove that the Central Powers are much more vulnerable than the Allies in fiscal matters. Russia and Serbia, it is true, are situated very differently from England and from France in their business intercourse with Germany and Austria, and Belgium and Italy, though on the final balance they are favourably placed, do not enjoy the marked advantages of their more considerable friends. But help, in developed trade between the countries of the Entente, would free effectively the less fortunate members from dependence on the enemy, and could, with mutual benefit, be given and received. In any case the general conclusion is established that the Allies conduct with their existing foes but a sixth or seventh part of their whole commerce, while Austria and Germany on the other hand owe to the Entente as large a proportion as a half of their foreign trade.

Such then is the dominating characteristic of the position as he represents it, and to this a plea is added that the capacity of Germany for future war should be crippled by the conveyance of the iron of Lorraine to French possession, in addition to the restoration of Alsace and the independence of Luxemburg. A clear separation should also, he declares, be made between certain requirements on economic matters, such as indemnities and reparation, and guarantees for the transit of goods, which might form part of the peace negotiations, and the more permanent fiscal programme advocated in this book. Its constituent elements, apart from a colonial tariff, are four in number. They are a preferential tariff between the Allies themselves, a "minimum" or "general" tariff to be offered to neutrals, who need not be deprived of the "most-favoured nation" clauses of existing treaties, and a semi-prohibitive tariff to be set up against enemies. M. Lavergne's clear and vigorous exposé may be commended to those who will agree, and those who may probably disagree, with his opinions. They are tersely expressed, and little room is left for ambiguity or misunderstanding. L.L.P.

10.—*L'effort Économique de la France pendant deux ans et demi de Guerre.* Bureau d'études de l'information diplomatique, Berger-Levrault, Libraires-éditeurs. 142 pp. Paris 1917. Price 1 fr. 50.

This little book, probably of composite authorship, contains a matter of fact record of the chief events of economic importance in France during the war, and gives simple statistics of the effect of administrative action taken, in such a way that the strain of war upon that country and the way it has been met can be realized and to some extent compared with our own. The financial effort, with special reference to the Bank of France, is given briefly with comparative figures, and stress is laid upon the fact that while England has been found a useful ally in financial arrangements made in other countries, she has been in turn rendered great assistance by France in regard to the gold position of London in relation to the American exchanges. The section upon the agricultural effort contains interesting details of official action taken to provide machinery for co-ordinating all available labour, and for distributing properly the seed-stuffs, fertilizers, and animals, and also of the steps taken to keep the price of corn low but remunerative and uniform. In these respects, the French appear to have been, in point of time and range of activity, ahead of us, and it seems that as a result the people have suffered less by exploitation and economic chance. The action taken had quick results, and the autumn of 1916 found the area of uncultivated land sensibly diminished, while the position with regard to horses, cattle and sheep was rapidly improving, and the chief cereals showed a higher yield per hectare. Agriculture is to emerge from the conditions of war full of new vigour for the future. Other sections deal with the part played by railways, and with the organization of assistance to refugees—nearly a million in number, of which some 160,000 were Belgian. The final and longest section treats of industrial activities in some detail, showing the percentages of persons in each category mobilized, and the net displacements of labour. The development of the manufactures of explosives is given as follows: August, 1914, 100; May, 1915, 1,400; December, 1915, 3,500; March, 1916, 4,400; July, 1916, 6,500. In October, 1916, the manufacture of mitrailleuses compared with August, 1914, was as 164 to 1, and of rifles 295 to 1, while the number of heavy guns in *existence* in October, 1916, was twenty-three times greater than at the beginning of war. The substitution of public and private co-ordination for chance and competition is relied upon, in the forecast of a bright future for the economic life of our indomitable allies. J.C.S.

11.—*Other New Publications.**

Aronovici (*Carol*). Bureau for Social Research of the Seybert Institution. The Social Survey. ix + 255 pp., 8vo. Philadelphia: The Harper Press, 1916. Price $1.25 cents.

[Parts of this useful little book have already been published, and it has been put into book form for the guidance of those undertaking social surveys, though not claiming to be exhaustive of the subjects discussed. Among these are town-planning, industries, health, leisure, education and crime. There is a brief chapter on statistical method, and a classified bibliography and fair index. There are also charts and diagrams.]

Atkinson (*Henry*). A Rational Wages System. Some notes on the Method of Paying the Worker a Reward for Efficiency in Addition to Wages. xii + 112 pp., 8vo. London: G. Bell and Sons, 1917. Price 1*s.*

[The author has had some experience of the American methods known as scientific management, and advocates their extension in this country for the benefit, he contends, of the workers. The book is divided as follows:—Preface. Introductory. Part 1. General Principles. Chaps. 1. Different Methods of Payment of Wages; 2. Wages and Efficiency Reward; 3. Wages and Progress. Part 2. An Application of the Principles to a Particular Case. Chap. 4. Work and Reward. Part 3. Explanation of Diagrams showing different methods of Reward Payment. Chap. 5. Reward and Efficiency. Appendix. A Floating Wage Rate.]

Bubnoff (*J. V.*). The Co-operative Movement in Russia. Its History, Significance and Character. 162 pp., 8vo. Manchester: Co-operative Printing Society, Ltd., 1917.

[This book is the first attempt in the English language to give a connected and systematic survey of the "Co-operative Movement in Russia." It begins with a short description of agriculture and the agricultural classes who form the bulk of the population and are the backbone of the co-operative movement in that country. Later chapters deal with the Co-operative Movement, Co-operative Unions and Co-operative Banks, and their various forms of Organization. The rôle of the Zemstvos in regard to Co-operation is also described. In the chapter on the War and Co-operation, an attempt has been made to describe some of the changes in the villages caused by the War, and in the final chapter, on "International Tendencies of Russian Co-operation," the author has sketched out a scheme for an International Co-operative Exchange which, he thinks, is likely to lead to practical results at no distant date.]

Chapman (*S. J.*). Outlines of Political Economy. Third edition. xvi + 463 pp., 8vo. London: Longmans, Green and Co., 1917. Price 6*s.*

[The first edition of this book was reviewed at length in the Society's *Journal* for January, 1912. In the present edition the book has been thoroughly revised and somewhat expanded, involving a complete resetting of the type. Its use as a text book had also indicated many ways in which it would be improved, and further additions have been rendered desirable by recent economic events arising from the war. Two chapters on the development of political ecoaomy have also been added.]

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* See also "Additions to the Library," page 585, *sqq.*

Coates (*William*). The Alternative Vote and What it would Effect. 20 pp., 8vo. London: P. S. King and Son, Ltd., 1917. Price 6*d.* net.

[A statistical study based on the Electoral Statistics of the proposal for the Alternative Vote, which, in the author's opinion, is an unjust one. The Alternative Vote, if adopted, would reduce Labour representation in Parliament and thereby promote Government by Party Caucus with its evils. The only remedy for this unsatisfactory state of things, the author considers, is the adoption of proportional representation.]

Ellinger (*Barnard*). Productivity of Labour after the War. 24 pp., 8vo. Manchester, 1917.

[This paper deals with the necessity of increasing the production of labour after the war, due to the fact that a large number of workers have during the war increased their standard of living, and that those who are now fighting will, on their return, wish to attain the same standard. Further, if the general standard of living is reduced, there will be, it is feared, serious labour trouble, and the enormous burden of taxation which will have to be met after the war can only be borne either by a reduced standard of living or an increased production of labour.]

Fisher (*Professor Irvine*). The "Ratio" Chart for plotting statistics. (Reprinted from Quarterly Publications of the American Statistical Associations. June, 1917.) 577–601 pp., 8vo. 1917.

[A plea for the use of the logarithmic scale in constructing statistical diagrams.]

Gide (*Charles*). Commercial Policy after the War. Translated by Ethel H. Ashworth. With Preface by the Right Hon. J. M. Robertson, M.P. 26 pp., 8vo. London: The Cobden Club, 1917. Cassell and Co. Price 3*d.*

[A condensed translation of Professor Gide's article dealing with the difficulties of a future international fiscal policy as outlined at the Paris Conference in June, 1916.]

Glazebrook (*Sir Richard T.*). Science and Industry. The place of Cambridge in any scheme for their combination. The Rede Lecture, 1917. 51 pp., 8vo. Cambridge: University Press, 1917. Price 1*s.* 6*d.*

[The lecture reviews some of the methods by which scientific investigation has aided our efforts against the enemy in the present war. These include flying, the development of methods of accurate workmanship, the reduction of sickness among the troops due to medical science and agricultural chemistry. The relations of pure science to industrial science are also discussed.]

Harleys (*Messrs.*). The Development of Town House Property. Profitless Properties made Profitable. 10 pp., sm. 8vo. London, 1917.

[Deals with the conversion of unremunerative house property into small flats, at present much in demand, and likely to remain so in Messrs. Harleys' opinion.]

Mackmurdo (*A. H.*). Electoral Reform. Voting by Occupations instead of by Districts. 16 pp., 8vo. London: Messrs. P. S. King and Son, Ltd., 1917. Price 3*d.*

[The author urges that occupation, not residence, should be the basis of franchise. The local constituency is a relic of the past when the population was small, occupations few, and each locality could easily select its representative. He contends that occupation groups are the only groups of citizens that can be effectually represented.]

Morton (*John A. J.*). The Industrial Counterpoise as the foundation for Social Harmony and Universal Peace. vi + 126 pp., 8vo. London: The Athenæum Press, 1917. Price 1*s.* 6*d.* net.

[Mr. Morton's proposals are not an outcome of the war. A brief statement of them was published anonymously in 1903, entitled "A Scheme for a National Minimum Wage and the Extermination of Poverty." The author considers that the need for a radical alteration of the industrial system is as urgent now as it was then, and the publication of the scheme in its present form seems to him opportune at this juncture because the war throws certain features of the scheme into prominence. The book is divided as follows:—Chapters 1. Introduction; 2. Blind Economic Forces; 3. Parasitic Wealth; 4. The Labour Movement; 5. Masked Charity; 6. Evolutionary Theory and Social Progress; 7. The Economics of Collectivist Industrial Tendencies; 8. The Nature of Land Value; 9. Policies of Land Reform; 10. The Theory of Exchange Value; 11. A New Standard of Exchange; 12. The Industrial Counterpoise; 13. The Double Currency; 14. The Minimum Wage; 15. Economic Readjustments; 16. Social Readjustments; 17. Conclusion.]

Ramsay (*J. Grant*). One Hundred Points in Food Economy. Sm. 8vo. London: G. Bell and Sons, Ltd., 1917. Price 1*s.* net.

Savory (*A. H.*). The Nakedness of the Land. The Agricultural Problem and its Solution. 71 pp., 8vo. Oxford: B. H. Blackwell, 1917. Price 1*s.* 6*d.* net.

[A careful review of the conditions of agriculture in this country by one who has had twenty-eight years' personal experience of farming. The book is intended for the information of those who are unacquainted with the details of the farm, and whose attention has been drawn to the urgent question of the food supply by the present scarcity and by the high prices caused by the war. Among the subjects discussed are the loss of arable land due in part to falling wheat prices, small holdings, co-operation, and the Corn Production Bill, which is criticized. The author advocates among other remedies a moderate duty imposed upon imported corn, and minimum prices fixed for a term of eight to twelve years, with not less than four years' notice of alteration.]

Spooner (*Henry J.*). Industrial Fatigue in its Relation to Maximum Output. Forewords by Sir Robert Hadfield, F.R.S., and Mr. J. R. Clynes, M.P. 59 pp., sm. 8vo. London: Labour Copartnership Association, 1917. Price 6*d.* net.

[These articles are republished from *Co-partnership*, and give a good summary of what has been written on the relation of industrial fatigue to output. Sir Robert Hadfield in a foreword points out the drawbacks of overworking methods, and is not much in favour of the American system of scientific management. The pamphlet also contains suggestions in regard to suitable employment for disabled soldiers.]

Our Financial Policy and the Rate of Interest. A Criticism. 60 pp., 8vo. London: P. S. King and Son, Ltd., 1917. Price 6*d.* net.

[An examination of the financial policy of the Government in relation more especially to war loans issued at different rates of interest, and of their influence in reducing the values of fixed interest-bearing securities, and on the money market generally.]

U.S.A. Department of Agriculture. Bulletin No. 473. Production of Sugar in the United States and Foreign Countries. 70 pp., 8vo. Washington: Government Printing Office, 1917.

[A useful summary of the world's production of sugar from 1903, when the Brussels Sugar Convention came into operation, to the close of the sugar year 1912–13, with a comparison of the preceding decade.]

U.S.A. Department of Agriculture. Bulletin No. 501. A Study in the Cost of Producing Milk on four dairy farms in Wisconsin, Michigan, Pennsylvania and North Carolina. 35 pp., 8vo. Washington: Government Printing Office, 1917.

[The purpose of this bulletin is to outline the problem of obtaining the cost of producing milk on farms, and to show the relationship among the various items making up the total cost, as indicated by the data obtained.]

United States. War Finance Primer issued by the National Bank of Commerce in New York. 136 pp., 8vo. 1917.

[This book has been compiled as an aid to clear thinking on the fundamental questions of war finance, and thereby to strengthen the financial programme of the United States Government. Its contents are as follows:—Part 1. British War Loan Advertisements. Part 2. How to Finance the War, by Professor E. R. A. Seligman.—Loans *versus* Taxes; Loans; Taxes. Part 3. Financial Management of a War, by Henry C. Adams, Ph.D., LL.D. Part 4. Bonds and Taxation—Wealth; Loans; Public Debts and Annual Debt Charges; Taxation of the Belligerent Nations. Part 5. War Finance Act.]

CURRENT NOTES.

The values of our foreign trade for the twelve months ended July show, on the side of imports, an increase exceeding 10 per cent. over the corresponding figures of a year earlier, and for exports of produce and manufactures of the United Kingdom an increase of over 14 per cent. Re-exports show a decrease of 13 per cent. in value, and if the values of re-exports be deducted from those of imports the percentage increase of the balance is slightly in excess of that for exports of domestic produce. The import figures show an increase in the "Food, Drink and Tobacco" class, amounting to 17 per cent., and in the "Raw Materials" class an increase of practically 18 per cent., while manufactured imports show a decrease of nearly 17 per cent. If the rise in prices accounts, as it well may, for the major part of the increases in the former two classes (and it may be the case that it has been sufficient to account for more than the increases shown, though the matter cannot be tested for food imports, since quantities are no longer published in the monthly accounts) the same upward tendency of prices makes the decrease in the manufactured imports the more noteworthy. The proportionate increase in the value of exports of domestic manufactured goods is rather over 17 per cent., giving a curious parallelism with the increases in imports of food and raw materials.

The values of the principal classes of merchandise imported and exported in the twelve months ended July, 1917 and 1916, respectively, were as follows :—

	Twelve months ending July, 1917.	Twelve months ending July, 1916.	Increase (+) or Decrease (−).
Imports, value c.i.f.—	£'000.	£'000.	£'000.
I. Food, drink and tobacco	469,284,	400,789,	+ 68,495,
II. Raw materials and articles mainly unmanufactured	352,871,	299,536,	+ 53,335,
III. Articles wholly or mainly manufactured	162,158,	194,820,	− 32,662,
IV. Miscellaneous and unclassified (including parcel post)	4,560,	2,987,	+ 1,573,
Total merchandise	988,873,	898,132,	+ 90,741,

	Twelve months ending July, 1917.	Twelve months ending July, 1916.	Increase (+) or Decrease (–).
Exports of produce and manufactures of the United Kingdom, value f.o.b.—	£'000.	£'000.	£'000.
I. Food, drink and tobacco	22,468,	28,221,	– 5,753,
II. Raw materials and articles mainly unmanufactured	67,885,	59,433,	+ 8,452,
III. Articles wholly or mainly manufactured	409,297,	349,109,	+ 60,188,
IV. Miscellaneous and unclassified (including parcel post)	19,747,	17,893,	+ 1,854,
Exports of foreign and colonial merchandise, value f.o.b.—			
I. Food, drink and tobacco	13,124,	21,238,	– 8,114,
II. Raw materials and articles mainly unmanufactured	49,542,	53,756,	– 4,214,
III. Articles wholly or mainly manufactured	23,650,	25,279,	– 1,629,
IV. Miscellaneous and unclassified	110,	74,	+ 36,
Total British, foreign and colonial	605,823,	555,003,	+ 50,820,

If reference be made to the figures of the calendar years 1916 and 1915 (*see* p. 145 of the Journal, January, 1917), the comparison yields some striking results. The campaign for the restriction of imports appears to show its fruits in the figures of manufactured imports and re-exports, since moderate increases in this class have given place to decreases, while the expansion in the value of imported raw materials has not been checked and food imports have increased in value by considerably more in the period covered by our present survey than in that surveyed in the January issue of the Journal. A further point of no small importance in the comparison is the reduced rate of increase in the value of the exports of domestic manufactures, the increase for the year 1916 having been 100,000,000*l.*, while for the twelve months to July, 1917, the increase was but 60,000,000*l.* The excess of imports over exports, which was 368,000,000*l.* in the year 1915 and fell to 343,000,000*l.* in the twelve months ended July, 1916, remained at about the same figure, namely, 345,000,000*l.* for the calendar year 1916. For the twelve months ended July, 1917, however, it had again risen, reaching 383,000,000*l.* To what extent these formidable figures should be supplemented on account of government imports not included in the published accounts can only be conjectured.

During May, June and July the high level of employment has been maintained and much overtime has been worked in many of the principal trades. The following are the percentages of unemployed as shown by the Trade Union returns and the returns under the National Insurance Acts :—

Percentage at end of	Trade Union returns.	National Insurance Acts.	
		1911.	Part II. (Munition Workers).
May	0·4	0·59	0·82
June	0·4	0·62	0·88
July	0·4	0·62	0·82

The figures for the end of May all show a slight rise on those for the preceding month, due mainly to small increases of unemployment in the building trades, printing, bookbinding and paper, and several of the metal trades.

The employers' returns for the textile and other trades continue to show the same general feature of a fall of 5 to 6 per cent. in the numbers employed, as compared with last year, accompanied by an increase of 8 to 10 per cent. in the wages paid :—

Week ending	Textile trades. Percentage change on a year ago.		All trades covered by the returns. Percentage change on a year ago.	
	Numbers employed.	Wages paid.	Numbers employed.	Wages paid.
May 26	−5·1	+10·6	−6·1	+10·0
June 23	−5·2	+ 7·9	−6·3	+ 7·9
July 21	−5·4	+ 8·1	−6·1	+ 8·7

The increases in wages and war bonuses reported in May affected 290,000 workpeople and resulted in a total increase of some 45,500*l.* per week: in June they affected 360,000 workpeople and amounted to 60,000*l.* per week: and in July they affected some 400,000 workpeople and were estimated to amount to 30,000*l.* per week. The building, textile, and printing trades, and transport workers, amongst others, have shared largely in the rise.

In Germany the percentage of unemployed, as shown by the Trade Unions' returns and cited in the *Labour Gazette* has continued to fall. From 1·6 per cent. in February it dropped to 1·3 per cent. in March, 1·0 per cent. in April and 0·9 in June, as compared with 2·2 per cent., 2·3 per cent. and 2·5 per cent. last year. Conditions seem most severe in certain European neutral countries. Returns from Trade Unions and municipal employment funds in Holland with a total membership of nearly 115,000 showed 10·2 per cent. of unemployed in May this year as against 5·1 in May, 1916. According to returns supplied to the Danish statistical office 11·6 per cent. of nearly 153,000 members in the Danish Trade Unions reporting were unemployed at the end of March as against 9·0 per cent. in March, 1916.

The rise in retail food prices in the United Kingdom continued during May and June, but July was marked by a slight fall. The percentage increase over the prices of July, 1914, as shown by the index-numbers published in the *Labour Gazette*, rose from 98 at the beginning of May to 102 on June 1, and 104 on June 30, but fell again to 102 on August 1. During May and June beef and mutton, especially the latter, showed a marked increase in price, and the rise in the price of margarine also continued. The introduction of " Government cheese " in June brought about a noticeable fall of over 1¼*d.* per lb. or 7 per cent. in the price of that commodity. July was remarkable not only for a very substantial fall in the price of potatoes when the new crop came on the market, but also for the first fall in the price of margarine since the autumn of last year. Fish and cheese were also rather cheaper during July, and meat showed little alteration, but bacon, butter and eggs were dearer.

As compared with July, 1914, the price of the various cuts of meat covered by the returns showed, in July, 1917, advances ranging from 100 to over 190 per cent., or 7½*d.* to 10¼*d.* per lb. Bacon was 83 per cent. or 9¼*d.* per lb. dearer. The average price of bread was double—that of flour rather more than double the corresponding figure for July, 1914, the increase amounting to 5¾*d.* per 4 lb. of bread and 11¾*d.* per 7 lb. of flour. Tea showed a rise of 75 per cent., about one-half of the advance being due to increased taxation. Granulated sugar has nearly trebled in price during the war, part of the advance being attributable to increased duty. Milk, butter and margarine were 60 to 70 per cent. dearer than in July, 1914. Cheese was nearly double the pre-war price, and for fish and eggs average increases of roundly 120 per cent. were recorded. The smallest advance over the pre-war figures was in the price of potatoes, which averaged about 50 per cent. or 2½*d.* per 7 lb. above the level prevailing in July, 1914 ; in the months preceding July much higher prices, however, were reached.

It is pointed out that the general perçentage increase is arrived at on the basis of an average pre-war family budget, and that considerable economy could be effected by a change of dietary. Thus if eggs were omitted from the diet, margarine substituted for butter, and the consumption of sugar and fish reduced to one-half of that prevailing before the war, the general percentage increase since July, 1914, instead of being 102 would be only 67.

The increase from July, 1914, to August 1, 1917, in the cost of all the items ordinarily entering into working-class family expenditure, including food, rent, clothing, fuel and light, &c., is estimated at nearly 75 per cent., taking the same quantities and descriptions of the various items at each date and eliminating advances arising from increased taxation.

No further information is available as regards the course of retail food-prices in Germany. A calculation given in the *Labour Gazette* for August, and based on retail prices published in the official *Warenpreisberichte*, gives the rise of retail food prices in Vienna since July, 1914, as 188 per cent. The prices recorded, with only three exceptions (butter, margarine and eggs), are the official maxima fixed by law. The following are the latest figures cited in the *Labour Gazette* for the rise of retail food prices in other countries since July, 1914:—Switzerland (March 1), 57·3; Italy (end of April), 63·9; Norway (March), 82; Australia (February), 25·6; New Zealand (March), 25·8; Canada (June), 60·2; United States (April 15), 41.

Turning to wholesale prices, the *Statist* and *Economist* index-numbers have run as follows:—

End of	Statist index-number.	Economist index-number.
July, 1914	82·4	116·6
May, 1917	175·0	246·0
June, 1917	181·2	256·6
July, 1917	177·7	253·6

The increase in the price level during May was small, the index-numbers advancing from 173·0 (revised figure) and 244·5 respectively at the end of April. During June, on the other hand, as will be seen from the above table, there was a very sharp advance followed by a decline in July. The advance in May was mainly due to a considerable rise in meat and in cotton, which touched 14½*d.* at the end of the month: bacon, butter and some miscellanea were lower. In June there was a strong advance in cereals, meat and sugar, a higher price for which was fixed by the Government at the beginning of the month, and cotton soared to nearly 19½*d.* on the 19th, when the Government stepped in and the Liverpool futures market was closed. The fall in July was brought about by a heavy drop in potatoes, when the abundant new crop came on the market, and decreases in cereals, meat and other foodstuffs. There was a conspicuous fall in tea owing to the new arrangements for controlled sales. In textiles there was a further rise, cotton being still affected by the June crisis and barely ½*d.* cheaper on the month, while silk, flax and hemp appreciated.

As compared with the prices of a year ago the *Statist* index-number for July shows a rise of about 36 per cent., the *Economist* number an advance of nearly 38 per cent. Making the comparison with the pre-war figures for July, 1914, the *Statist* number gives a rise during the three years of war amounting to nearly 116 per cent., the *Economist* number a rise amounting to rather over 117 per cent., the two index-numbers thus giving very concordant results.

The weekly gazette prices of British wheat per imperial quarter during recent months have averaged as follows:—March, 79*s.* 7*d.*; April, 82*s.* 7*d.*; May, 78*s.* 0*d.*; June, 78*s.* 1*d.*; July, 78*s.* 2*d.* The sharp fall after April was the immediate result of the Wheat, Barley and Oats (Prices) Order (April 16, 1917), which fixed a maximum price of 78*s.* per quarter for wheat of the 1916 harvest, free on rail or delivered at the buyer's premises at the option of the seller. In the case both of wholesale and retail prices it must now be remembered that Government regulation is rapidly becoming a more and more important factor.

In the early part of 1915 the Bureau of Labour Statistics of the United States made an investigation into unemployment in New York City, and the Metropolitan Life Insurance Company of New York at about the same time instituted an enquiry as to unemployment in the families of the holders of its industrial policies in New York which yielded results very similar to those of the Bureau of Labour Statistics. Further use has since been made of the method of enquiry by means of the agents of the company, 16 cities in the East and Middle West being canvassed in March and April, 1915, and 12 cities in the Rocky Mountain and Pacific Coast States in June and July, 1915. In September, 1915, the double enquiry in New York City was repeated. The results of these enquiries have been published in a recent bulletin of the Bureau. The enterprise of the

Insurance Company is worthy of special notice, suggesting as it does considerable possibilities of social enquiries without the necessity for creating a special apparatus for the purpose of the collection of material.

In the 16 cities of the March–April enquiry there were canvassed 401,548 families, aggregating 1,694,895 persons, and including 647,394 wage earners. Only 2.4 per cent. of the schedules were rejected, the percentage of rejections ranging from 1.4 in Minneapolis and Pittsburg to 4.1 in Milwaukee. The average percentage of wage earners found to be unemployed was 11.5, and a further 16.6 per cent. were employed only part time. The percentage of unemployment reached 20.3 in Duluth where the part time percentage was 17.8, together pointing to an industrial position which must be regarded as very serious if the families canvassed were an average sample of the wage-earning population.

The numbers of families covered by the enquiry in Boston, Chicago, Philadelphia, Pittsburg and St. Louis were so considerable that an estimate is given in the bulletin of the total wage-earning population of each sex and the total unemployed in each of these cities. 530,114 wage earners were covered by the canvas in these cities, and the estimated total of wage earners was 2,837,226, the average percentage of total unemployment being 12. For female workers the percentage was under 9, for males 13, male wage earners being practically three times as numerous as female wage earners in these cities.

The particulars of the numbers employed in each principal occupation are given for each city, and, of even greater importance, as indicating that the high rate of unemployment was no accidental result of the particular date at which the enquiry took place, the numbers of unemployed are classified by the duration of their unemployment. These tables give the remarkable result that a duration of over two months but under three months were more common than any other duration, that in the five cities for which the largest representation of wage earners was secured 20 per cent. of the unemployed had been out of work for over six months, and in the remaining cities the average percentage of those canvassed whose unemployment had passed the half-year mark was 15. Unemployment did not extend to the longer periods with quite such persistence among females as among males. In 82½ per cent. of the cases reported on the cause of unemployment was stated to be "no work to be found," in 11 per cent. it was sickness or disability, in one-half of 1 per cent. strikes or lock-outs. Similar results are obtained from the particulars relating to the 12 cities in the further west, except that the unemployment recorded was of shorter duration, the most frequent periods falling between a fortnight and a month, while periods between four and six months were more than twice as numerous as those between three and four months. Cases in which unemployment had endured for over six months formed 25 per cent. of all cases for which the duration was ascertained for males, and 20 per cent. of those for females.

Some interesting comparisons can be made between the figures relating to the enquiries made in the City of New York in January–February and in August–September. The two enquiries by the Bureau related to approximately the same number of families and persons, but at the later date as compared with the former less than half the number of families and but little over two-fifths of the number of persons were affected with unemployment. Long period unemployment remained a relatively important factor at the later date, however, the percentage of all cases of unemployment in which the duration exceeded 60 days being greater at the later date, and, for longer durations, progressively greater, until it was over twice as great for durations exceeding six months, and the actual numbers recorded for these prolonged periods were only about one-tenth smaller at the later date than at the earlier, in spite of the lower level of prevalence of unemployment. The classification of causes of unemployment in New York in September, 1915, gave results essentially similar to the averages of those secured earlier in the year for other cities to which reference has already been made, the main exception being a larger percentage of cases due to sickness or disability, namely, 15 per cent. of all cases of unemployment reported on.

The rates of unemployment resulting from the enquiries of the Metropolitan Life Insurance Company, which extended in January, 1915, to nearly three times, and in September, 1915, to nearly twice as many families as the corresponding enquiries of the Bureau of Labour Statistics, were somewhat higher than those resulting from the latter enquiries, but a reduction in September to one-half the rate of unemployment recorded for January results from the enquiry among holders of the policies of the Insurance Company. In the measures secured of the duration of unemployment, and the relative prevalence of different groups of causes, the two enquiries gave results of similar character.

The Local Government Board have published a report on the provision made by Public Health Authorities and Voluntary Agencies in England and Wales in connection with maternity and child welfare. The report is mainly composed of a detailed summary of the provisions made in various administrative areas, but to this is prefixed a useful general sketch. At present all but one of the Metropolitan boroughs, all the county boroughs, except Gateshead, 51 out of 61 county councils and 360 country districts have some provision for health visiting. 321 voluntary societies are engaged in maternity and child welfare work, their activities springing from one or more centres. At the end of February, 1917, 603 whole time and 842 part time health visitors were employed by local authorities ; it is pointed out that, on the basis of 500 births per visitor, the staff is still very deficient. Statistics of midwives are also furnished, an interesting point being the large number of trained and certificated midwives who do not practise. Thus on March 31, 1916, 30,543 trained and certificated midwives were on the roll of the Central Board, but only 6,754 gave notice of their intention to practise in the year 1915. The reason why more trained midwives do not practise is said to be the increasing difficulty of making a living.

The Supplement to the Report of the Medical Officer of the Local Government Board on Child Mortality at ages 0–5 (Cd. 8496) contains much statistical information respecting the extent and presumed causes of child mortality in England and Wales and includes several interesting maps. Particularly valuable are the detailed statistics of the distribution of mortality within the subdivisions of certain towns. Thus in Middlesbrough (1911–14) the death-rate per 1,000 births at ages under 5 was 251 for the whole borough, compared with 164 for all England and Wales, while the rates for individual wards of the borough varied from 145·9 to 369·0. Similar intralocal divergences occurred at St. Helens with a general rate of 242 ; here the best ward had 199·6 deaths per 1,000, the worst 354·0. The report comments in scathing terms upon the state of affairs revealed at Middlesbrough, which, Sir Arthur Newsholme thinks, "need not continue to be the centre "of destruction of human life and health which it is at the present "time." Due credit is given for what has been already achieved both there and elsewhere in the direction of social and sanitary reform, but most readers will endorse Sir Arthur's opinion that a great deal still remains to be done.

The United States Department of Labour has recently issued an interesting report on "Maternal Mortality from all Conditions "connected with Childbirth in the United States and certain other "Countries," by Dr. Grace L. Meigs. The authoress points out that in the death registration area of the United States 9,876 women lost their lives owing to conditions caused by childbirth during the year 1913, and that tuberculosis alone was responsible for a larger number of deaths among women between the ages of 15 and 45. It is estimated that at least 15,000 deaths were due to childbirth in the whole of the United States (1913), while the death-rates from childbirth and childbed fever in the registration area have not demonstrably decreased between 1900 and 1913. The corresponding rates in 16 other countries are tabulated, fallacies in and difficulties of international comparisons being carefully discussed. The report contains much information of value to the English reader.

The Final Report of the Royal Commission on the Natural Resources, Trade and Legislation of certain portions of His Majesty's Dominions (Cd. 8462) recently published marks the end of five years' labour on the part of the ten Commissioners, who included Sir Rider Haggard and Sir Alfred Bateman, under Lord D'Abernon. Interim reports dealing with individual Dominions have previously been issued, and in the final report a general survey is made of questions affecting all portions of the Dominions, *e.g.*, migration, conservation and development of resources, oversea communications, improvement in commercial practice. The thoroughness with which the commissioners did their work is well illustrated by their treatment of the subject of migration. The statistics bearing upon the subject were exhaustively analysed and the conclusions of the Commissioners worked out scientifically and in detail. These conclusions, deduced from analyses of the best data available, can be assailed only by similar scientific methods. On the question of the shortage of women in the Dominions, the Commissioners point out that in the Metropolitan areas in Australia women numerically predominate over men to as great an extent as in the boroughs of England and Wales, and that accordingly the problem in the Dominions is largely one of better distribution of female population between town and country.

The chapter in the Report on Scientific Research in Relation to the Development of Natural Resources contains some severe strictures on the work of the Imperial Institute. The Commissioners recommend that the Institute should become altogether (as it is already, to the extent of nine-tenths of its work) a research centre for

India, the Crown Colonies and Protectorates and that the self-governing Dominions should concentrate their efforts on the development of their own research institutions.

The subject of most general interest to statisticians in the Report is probably the recommendation for the establishment of an Imperial Statistical Office working in conjunction with an Imperial Development Board. It has required a great war to convince our rulers of the utility of statistical organizations. Vital decisions have been delayed months and millions of pounds spent unnecessarily owing to lack of information and the organization necessary for the collection of that information. The Commissioners wisely make no recommendations as to the scope of such an office, suggesting that this could best be determined by the Conference of Statisticians which they propose should be held. Such a conference would be kept busy if it dealt only with the items suggested by the Commissioners, viz. :—

(*a*) Methods of improving statistics of migration.
(*b*) The possibility of making quinquennial enumerations of population on a uniform basis on the same day throughout the Empire.
(*c*) The unification and co-ordination of trade statistics.
(*d*) The possibility of collecting by co-ordinated effort and on a uniform basis statistics of movements of capital, and figures as to prices, wages and cost of living.
(*e*) The collection and preparation of agricultural, mineral, forest and fishery statistics on a common basis and in a uniform manner.

While complete uniformity may be unattainable, owing to the variety of conditions to be represented, a considerably closer approach to uniformity than exists at present might result from the deliberations of such a conference as is proposed.

Attached to the Report is a vivid general survey of the Dominions, which might with advantage be reprinted as an introduction to Empire geography for the use of schools.

The King's Birthday Honours List included the names of the following Fellows of the Society :—

Sir Thomas H. Elliott, K.C.B. ; Sir Robert A. Hadfield, F.R.S. ; Sir Philip Magnus, M.P. ; and Mr. Arthur H. D. Steel-Maitland, M.P., who have been made Baronets ; Mr. J. M. Keynes, who has been made a Companion of the Bath ; Captain Ernest G. Pretyman, M.P., who has been made a Privy Councillor ; and Sir William H. Lever, who has been raised to the Peerage as Baron Leverhulme.

STATISTICAL AND ECONOMIC ARTICLES IN RECENT PERIODICALS.

UNITED KINGDOM—

Accountants' Magazine. June, 1917—The Banking Outlook.

Associated Accountants' Journal. June, 1917—Babel of Measures. British Trade Corporation. The Finance Bill, 1917.

Bankers' Magazine—

June, 1917—The Budget. The Great Crisis: XXXV. American Credits: The British Trade Corporation. The "Quantity Theory of Money and after War Problems": *Morris* (*Frank*). Towards Reorganisation of International Finance.

July, 1917—The Great Crisis: XXXVI. Banking Profits in the First Half of 1917. The British Trade Corporation. Why Foreign Service is Unpopular. A Veteran Economist.

Biometrika. May, 1917—Macdonell (W. R.). Born October 16, 1852. Died May 15, 1916. Further Supplementary Tables for Determining High Correlations from Tetrachoric Groupings: *Lee* (*Alice*). On the Probable Error of Biserial η: *Pearson* (*Karl*). A Preliminary Report on some Breeding Experiments with Foxgloves: *Warren* (*Ernest*). On the Distribution of the Correlation Coefficient in Small Samples. Appendix II to the Papers of "Student" and R. A. Fisher. A Co-operative Study: *Soper* (*H. E.*) and *Others*. Tables for estimating the Probability that the Mean of a unique Sample of Observations lies between $-\infty$ and any given Distance of the Mean of the Population from which the Sample is drawn: *Student*. On the Representation of Statistical Data: *Isserlis* (*L.*). Relation of the Mode, Median and Mean in Frequency Curves: *Doodson* (*A. T.*). The Probable Error of a Mendelian Class Frequency: *Pearson* (*Karl*).

Economic Journal. June, 1917—The Netherlands Bank and the War: *Vissering* (*Dr. G.*). The Depreciation of British Home Investments, IV: *A Stockbroker*. Industrial Ireland under Free Trade: *Oldham* (*Prof. C. H.*). Anglo-Russian Economic Relations: *Gay* (*Jules*). Some German Economic Writings about the War: *Edgeworth* (*Prof. F. Y.*). The Cost of the War to Germany: *Guillebaud* (*C. W.*). Extracts from German Periodicals:—1. The Transition Period after the War; 2. German Demobilisation Plans; 3. Measures to Secure the Food Supply; 4. Principles of Maximum Price Policy. Obituary: Ernest Aves: (*G. T. R.*).

Eugenics Review. July, 1917—Eugenic Aspects of National Baby Week: *March* (*Norah*). Save the Children: *Scharlieb* (*Mrs.*). The Dysgenic Effects of Venereal Diseases: *Darwin* (*Major Leonard*). Teaching in Schools, Training Colleges and Colleges. From the point of view of the Eugenist.

UNITED KINGDOM—*Contd.*

Financial Review of Reviews. June, 1917—The Commercial Future of Flight: *Grahame-White* (*Claude*) and *Harper* (*Harry*). British Railway Problems: Financial, Economic and Political: *Good* (*E. T.*). The Curtailment of Luxuries: Its Economic and Financial Aspect: *Stiles* (*C. R.*). Women and Investment: *Greig* (*Jean*) and *Gibson* (*Mary V.*). The Shortage of Working-Class Dwellings: *Shelton* (*A. W.*).

Journal of the Institute of Actuaries. April, 1917—Opening Address by the President: *Warner* (*S. G.*). Frequency Curves and Correlation. Addendum (with Diagram) and Errata: *Elderton* (*W. Palin*). National Insurance Acts. The Departmental Committee's further and final Reports. Continuous Valuation Machinery: *McCormack* (*P. H.*). On a method of determining approximately the rate yielded by a redeemable Bond. Graduation by Makeham's Hypothesis. Summation Formulæ, with Second Difference Errors.

Journal of the Institute of Bankers. June, 1917—The Early Sheffield Banks: *Leader* (*R. E.*). The Quantity Theory of Money.

Public Health. June, 1917—Reviews of Public Health Problems from the Bacteriological Point of View: *Savage* (*William E.*). The Treatment of Venereal Diseases in U.S.A. Mode of handling Patients: *Goler* (*George W.*). Serum Diagnosis of Syphilis and Gonococcus Infection by Complement Fixation: *Wadsworth* (*A. B.*). Substitutes for Meats in the Dietary.

Royal Society of Edinburgh. Proceedings, Vol. XXXVII. Part III.—The Arithmetical Mean and the "Middle" Value of certain Meteorological Observations: *Becker* (*L.*).

Royal Philosophical Society of Glasgow. Proceedings, 1915–16. *Vol. XLVII.*—The War and Economic Progress: *Jones* (*J. H.*). On Paying our War Bill: *Scott* (*Prof.*).

INDIA—

Wealth of India—

April, 1917—The Indian Cotton Duties: *The Editor*. India's Contribution to the War: *Sarma* (*S. K.*). Agriculture in India: (*C. S. K.*). Increment Duty: *Aiyar* (*C. P. R.*). Capital in the United Kingdom after the War: *Pigou* (*Prof. A. C.*).

May, 1917—Economy of a Middle-Class Indian Home: *Chandavarkar* (*G. A.*), Dye-Stuffs of South India: *Amor Naturae*.

UNITED STATES—

American Economic Review. June, 1917—What the Federal Reserve System Has Done: *Willis* (*H. Parker*). Determinants of Lumber Prices: *Stephens* (*G. A.*). Marketing Functions and Mercantile Organization: *Weld* (*L. D. H.*). Real Wages in Recent Years: *Jones* (*F. W.*). Open Price Associations: *Tosdal* (*H. R.*). Railroad Equipment Obligations: *Dewing* (*A. S.*).

UNITED STATES—*Contd.*

American Journal of Sociology. May, 1917—Class and Caste. III. Segregation and Subordination: *Ross* (*Edward A.*). The Foundations of Educational Sociology: *Smith* (*Walter R.*). A Conservative's View of Poverty: *Weeks* (*A. D.*). Socialization of the Law: *Boyd* (*James H.*).

Annals of American Academy of Political and Social Science. July, 1917.—Contains a series of articles by different authors dealing with America's Relation to the World Conflict, grouped under the following heads:—Part 1. America's Relation to the World Conflict. Part 2. America's Obligation as the Defender of International Right. Part 3. Elements of a Just and Durable Peace. Part 4. The Problems of a Durable Peace. Part 5. Rights of small Nations. Part 6. American Participation in a League for the Maintenance of a Just and Durable Peace.

Bankers' Magazine (*New York*)—

May, 1917—The War Finance Plans: *Noyes* (*A. D.*). The Concentration of Taxes upon Wealth and Business: *Adams* (*T. S.*). Foreign Exchange: *Djörup* (*C.*).

June, 1917—The Liberty Loan. Evolution of Business: *Newell* (*E. J.*). Banking Service for Women. Emancipated Russia: *Dean* (*Rodney*).

Journal of Political Economy—

April, 1917—Legalizing Combinations for Export Trade: *Duncan* (*C. S.*). The Virginia State Debt and Internal Improvements, 1820–38: *Morton* (*Richard L.*). How to Avoid Government Ownership of the Railroads: *Carman* (*Ernest C.*).

June, 1917—Economic Conditions and the Birth-Rate after the War: *Wolfe* (*A. B.*). Railroad Co-ordination: *Arragon* (*A. V.*). Automobile Insurance Rates: *Riegel* (*Robert*). Medical Benefits under Workmen's Compensation. I: *Rubinow* (*I. M.*).

July, 1917—The War and Women's Work in England: *Abbott* (*Edith*). The Uniform Bill of Lading: *Duncan* (*C. S.*). Medical Benefits under Workmen's Compensation. II: *Rubinow* (*I. M.*).

Political Science Quarterly—

December, 1916—American Diplomacy in the European War: *Smith* (*Munroe*). The Federal Child-Labor Law. The Question of its Constitutionality: *Hull* (*Henry*). Another View of its Constitutionality: *Parkinson* (*T. I.*). The Trainmen's Eight-Hour Day: *Robbins* (*E. C.*). The "Parson's Cause": *Scott* (*A. P.*). New Light on the Monroe Doctrine: *Shepherd* (*W. R.*). McKinley and Foraker: *Kendrick* (*B. B.*).

March, 1917—The British Labor Movement and the War: *Humphrey* (*A. W.*). The Secret Sittings of the House of Commons: *Ilbert* (*C. P.*). Balkan Diplomacy. I: *Duggan* (*S. P.*). The Uprising against the East India Company: *Schlesinger* (*A. M.*). The Unearned Increment in Gary: *Haig* (*R. M.*). Wieser's Theory of Social Economics: *Mitchell* (*W. C.*). Thayer's John Hay: *Moore* (*J. B.*).

UNITED STATES—*Contd.*

Political Science Quarterly—Contd.

June, 1917—Canada's National Policy: *Porritt* (*E.*). Organization of Labor for War: *Northcott* (*C. H.*). Balkan Diplomacy. II: *Duggan* (*S. P.*). The Negro Vote in Old New York: *Fox* (*D. R.*). The Delegation of Legislative Power to Cities: *McBain* (*H. L.*). The Oregon Minimum-Wage Cases: *Powell* (*T. R.*). The Still Small Voice of the Herd: *Robinson* (*J. H.*).

EGYPT—

L'Egypte Contemporaine. *May*, 1917.—Les applications de l'électricité en Égypte. Ce qu'elles sont, ce qu'elles pourraient être: *Bourgeois* (*F.*). Le problème des Détroits: *Zohrab* (*K.*).

FRANCE—

Bulletin du Ministère du Travail. *April–May*, 1917—Le recensement de 1911: la population active. Indices économiques pour le premier trimestre. 1917.

Bulletin de Statistique et de Législation Comparée—

April, 1917—L'exploitation du monopole des allumettes en 1913. Relevé des opérations des bureaux de garantie en 1916. Situation, à la date du 31 mars 1917, du compte d'emploi des crédits budgétaires. Les revenus de l'Etat.

May, 1917.—Situation, à la date du 30 avril 1917, du compte d'emploi des crédits budgétaires. L'impôt sur les vélocipèdes en 1916. Les revenus de l'État. Allemagne. La charge fiscale pendant les dernières années de paix. Russie. Le Budget de l'exercice 1917.

June, 1917—Situation à la date du 31 mai 1917, du compte d'emploi des crédits budgétaires. Les revenus de l'État. Allemagne. Le budget de l'Empire pour 1917. Egypte. Le Budget de l'exercice 1917.

Journal des Économistes—

June, 1917—Le Régime des fabrications de guerre: *Yves-Guyot.* A qui le "dumping" porte-t-il tort?: *Bell* (*Sir Hugh*). La British Trade Corporation: *Raffalovich* (*A.*). Une Évaluation allemande de la richesse publique de l'Allemagne: *Ronce* (*P.*). Un Inventaire des ressources des colonies britanniques (Deuxième article): *Raffalovich* (*A.*). Mouvement scientifique et industriel: *Bellet* (*Daniel*). La Coopération économique franco-italienne: *Pantaleoni* (*M.*). La Majoration des tarifs de chemins de fer: *Yves-Guyot.* Flaubert, l'économie politique et la guerre: *Muller* (*Paul*). Le Régime de l'alcool en Russie: *Letort* (*Jean*).

July, 1917—Le Monopole de l'alcool: *Yves-Guyot.* Les Finances de la Grande-Bretagne pendant la guerre: *Williams* (*W. M. J.*). Discussion sur l'inflation: *Raffalovich* (*A.*). Gaspillages et économies aux armées: *Cauboue* (*Pierre*). Le Développement économique et la richesse de la Roumanie: *Bellet* (*Daniel*). Les Commissions techniques interalliées: *Fernand-Jacq.* Jurisprudence financière et commerciale: *Tchernoff* (*I.*). Un étalon monétaire international: *Moch* (*M. Gaston*).

FRANCE—*Contd.*

Journal de la Société de Statistique de Paris—

June, 1917—La langue celtique dans les îles Britanniques: *Meuriot* (*Paul*). Données statistiques d'ensemble sur les chemins de fer des États-Unis: *Bellet* (*Daniel*). Chronique de démographie: *Huber* (*Michel*). Chronique des questions ouvrières et des assurances sur la vie: *Bellom* (*Maurice*).

July, 1917—Travaux statistiques relatifs au service des retraites: *Courtray* (*M.*). La douane et la guerre (2^{e} communication): *Magnan* (*M.*). Quelques précisions sur le calcul des revenus: *Pupin* (*M. René*).

La Réforme Sociale. *June*, 1917—La Réforme de l'Esprit Public: *Bureau* (*Paul*). Les Retraites Ouvrières en Alsace-Lorraine: *Bohin* (*Louis*). Le Mouvement Économique et Social: *Lepelletier* (*F.*).

ITALY—

Giornale degli Economisti e Rivista di Statistica—

May, 1917—Dati sul costo dell'alimentazione. La diversa pressione tributaria del prestito e dell'imposta: *Griziotti* (*B.*). Produzione e consumo durante la guerra in Sardegna: *Vinelli* (*M.*).

June, 1917—Dati sul costo dell'alimentazione. Il mercato monetario e la guerra. La colonia Dalmata: *Todorovic* (*M. A.*).

July, 1917—Movimenti di Lunga durata dello Sconto e de Prezzi: *Bresciani-Turroni* (*C.*). Le curve di indifferenza nella teoria dei fenomeni collettivi di due argomenti: *Amoroso* (*Luigi*).

La Riforma Sociale—

May, 1917—L'Industria Elettrica e lo Stato: *Bonfante* (*P.*). Il Programma Economico-Politico della "Mittel-Europa" negli Scrittori Italiani prima del 1848: *Prato* (*G.*). Il Problema granario a Roma nell'epoca Imperiale: *Ferroglio* (*G.*). Trattato di pace e Trattati di Commercio: *Einaudi* (*Luigi*).

June, 1917—La Grande industria siderurgica in Italia: *Catani* (*Remo*) and *Jannaccone* (*P.*). Prezzi del Grano e Prezzi del Pane: *Contento* (*Aldo*). Consumi di guerra e Resistenza di Nazioni: *Simonazzi* (*Luigi*). Rassegna Bibliografica: Finanza teoretica ed applicata: *Borgatta* (*Gino*).

DENMARK—

Nationaløkonomisk-Tidskrift—

March–April, 1917—Privatfunktionærernes Pensionforhold: *Lytting* (*C. F.*). Industristaternes Toldpolitik i Krigens Belysning: *Ussing* (*Alf.*).

May–June, 1917—Ententens ernæringsproblemer: *Kaarsen* (*A. C.*). Økonomiske Oversigter. Danmark: *Cohn* (*Einar*).

SPAIN—

Revista Nacional de Economia. *April–May*, 1917—Existe en España una oligarquia politico-financiera?: *Riu* (*Emilio*). Las consecuencias económicas de la guerra: *Graziani* (*Augusto*). Función económica de los ferrocarriles secundarios: *Tallada* (*J. M.*). La colonización del monte Algaida: *Bello* (*Severino*). La Economia politica en sus relaciones con la guerra: *Graell* (*Guillermo*). Los ferrocarriles en Chile: *Martner* (*Daniel*).

BI-MONTHLY LIST OF ADDITIONS TO THE LIBRARY.

During the period that has elapsed since the end of May, 1917, the Society has received the publications enumerated below.

Note.—Periodical publications are not included in this list, but they will be acknowledged at the end of the volume.

(a) Foreign Countries.

Denmark—

Communications Statistiques. 4me Série Tome 52. Suicides et décès par accident 1906–15. Loyer dans les villes de province 1916. Les écoles primaires, &c., en 1914. 8vo. 1917. (The Statistical Bureau.)

Bulletin of Society for Study of Social Consequences of the War. No. 3. Fluctuation of the Populations during the World War. 1. Germany and France. 141 pp., 8vo. Copenhagen, 1917. (The Society.)

France—

L'Effort Économique de la France pendant deux ans et demi de Guerre. 139 pp., 8vo. Paris, 1917. (Librairie Berger-Levrault et Cie.)

Portugal—

Census. Recensement de la population du Portugal au 1er Décembre 1911. Part v. Population de fait, classée d'après les grandes divisions professionnelles en distinguant le sexe, par groupes d'âges. 215 pp., 8vo. 1916. (Direction Generale de la Statistique.)

Sweden—

Cost of Living. Levnadskostnaderna i Sverige 1913–14. Del ii. Lokalmonografier. 2. Goteborg. 3. Malmö. 2 vols., 8vo. 1917. (K. Socialstyrelsen.)

Switzerland—

Census. Résultats Statistiques du Recensement Fédéral de la Population du 1er Décembre 1910. Vol. 2. Répartition de la Population d'après le sexe l'état civil et l'âge. Confession et difference d'age des epoux vivant ensemble. lxxi + 462 pp., 4to. 1917. (Bureau fédéral de Statistique.)

United States—

Agriculture. Department of. Bulletins No. 387. Public Road Mileage and Revenues in the Southern States, 1914. lxxi + 52 pp., 8vo. 1917. (Department of Agriculture.)

—— 473. Production of Sugar in the United States and Foreign Countries. 70 pp., 8vo. 1917. (*Id.*)

—— 483. Statistics of Fruits in principal Countries. Production, Exports and Imports for the United States and Foreign Countries. 40 pp., 8vo. 1917. (*Id.*)

—— 492. An Economic Study of Farming in Summer County, Ga. 64 pp., 8vo. 1917. (*Id.*)

—— 501. A Study in the Cost of Producing Milk on four dairy farms in Wisconsin, Michigan, Pennsylvania and North Carolina. 35 pp., 8vo. 1917. (*Id.*)

—— 514. Wheat, Yields per acre and Prices, by States, 50 years 1866 to 1915. 8vo. 1917. (*Id.*)

—— 515. Corn, Yields per acre and Prices, by States, 50 years 1866 to 1915. 8vo. 1917. (*Id.*)

Census Bureau. Tentative Program of the Bureau of the Census. 1916–19. July 1, 1916. 14 pp., 8vo. 1917. (The Bureau.)

(a) Foreign Countries—*Contd.*

United States—*Contd.*

Children's Bureau. Maternal Mortality from all conditions connected with Childbirth in the United States and certain other countries. 66 pp., 8vo. 1917. (The Bureau.)

Labour. Bulletin of the Bureau of Labour Statistics. Whole Nos.:—

199. Vocational Education Survey of Minneapolis, Minn., made by the National Society for the Promotion of Industrial Education. 592 pp., 8vo. 1917. (The Bureau.)

208. Profit Sharing in the United States. 188 pp., 8vo. 1917. (*Id.*)

211. Labour Laws and their Administration in the Pacific States. 150 pp., 8vo. 1917. (*Id.*)

New Jersey. Vineland Training School. Anthropometry as an aid to Mental Diagnosis. A simple method for the examination of Sub-Normals. By *A. E. Doll.* 91 pp., 8vo. New Jersey, 1916. (The Training School at Vineland.)

New York (*City*)—

Monograph on the Epidemic of Poliomyelitis (Infantile Paralysis) in the New York City in 1916. 391 pp., 8vo. 1917. (Commissioner of Health.)

Tuberculosis Monograph. April and May, 1917. 2 vols., 8vo. New York, 1917. (*Id.*)

International—

Statistique Internationale. Etat de la Population. 1. Tableaux. 123 pp., 4to. Stockholm, 1875-76. (Dr. G. B. Longstaff.)

(b) United Kingdom and its several Divisions.

United Kingdom—

Emigration and Immigration. Copy of Statistical Tables relating to Emigration and Immigration from and into the United Kingdom. 1876 to 1889 and 1891 to 1895. 2 vols., fol. (Dr. Longstaff.)

Population. Tables of Population. Deaths. 1812-64. Population and Deaths. 1812-64. And Average Annual Proportion of Deaths from specified causes at specified ages during the ten years, 1861-70. Three papers bound in 1 vol. (*Id.*)

England and Wales—

Census of 1911. General Report with appendices. [Cd-8491.] x + 383 pp., fol. London, 1917. (General Register Office.)

London. A Collection of the Yearly Bills of Mortality from 1657 to 1758 inclusive, together with several other bills of an earlier date. 4to. London, 1759. (Dr. Longstaff.)

(c) Authors, &c.

"*Ametochos Tis.*" Nach 1000 Tagen. Allgemeine Weltwirtschafts-Richtlinien als alleiniges Kriegsziel und der nahende Friede. 24 pp., 8vo. Zurich, 1917. (Art Institut Orell Fusli.)

Aronovici (*Carol*). Bureau for Social Research of the Seybert Institution. The Social Survey. ix + 255 pp., 8vo. Philadelphia, 1916. (The Harper Press.)

Atkinson (*Henry*). A Rational Wages System. Some notes on the method of paying the worker a reward for efficiency in addition to wages. xii + 112 pp., 8vo. London, 1917. (G. Bell and Sons, Ltd.)

Brend (*William A.*). Health and the State. xi + 354 pp., 8vo. London, 1917. (Constable and Co., Ltd.)

Bubnoff (*J. V.*). The Co-operative Movement in Russia. Its History, Significance and Character. 162 pp., 8vo. Manchester, 1917. (Co-operative Printing Society, Ltd.)

(c) **Authors, &c.**—*Contd.*

Burgess (*Jas.*). The Definite Integral $\frac{2}{\sqrt{\pi}}\int_{0}^{t}\epsilon^{-t^2}dt$ with extended tables of Values. From Transactions of Royal Society of Edinburgh. Vol. XXXIX. Part 2. No. 9. Pages 258–321 4to. Edinburgh. (Prof. F. Y. Edgeworth).

"*Clarity.*" Our Future. Some Urgent Economic, Social and Industrial Problems. To which is appended a Special Section on the Woollen Industry. xix + 166 pp., 8vo. London, 1917. (T. Murby and Co.)

Coates (*William*). The Alternative Vote and What it would Effect. 20 pp., 8vo. London, 1917. (P. S. King and Son, Ltd.)

Davies (*Joseph E.*). Trust Laws and Unfair Competition. xlviii + 852 pp., 8vo. Washington, 1916. (Department of Commerce.)

Dawson (*William Harbutt*), Editor. After-War Problems. (By the Earl of Cromer, Viscount Haldane, the Bishop of Exeter, Professor Alfred Marshall and others.) 366 pp., 8vo. London, 1917. (G. Allen and Unwin, Ltd.)

Ellinger (*Barnard*). Productivity of Labour after the War. 24 pp., 8vo. Manchester, 1917. (The Author.)

Farr (*William*). Vital Statistics. A Memorial Volume of Selections from the Report and Writings of W. Farr. Edited by N. A. Humphreys. xiv + 563 pp., 8vo. London, 1885. (Dr. Longstaff.)

Gide (*Charles*). Commercial Policy after the War. Translated by Ethel H. Ashworth. With Preface by the Right Hon. J. M. Robertson, M.P. 26 pp., 8vo. London, 1917. (The Cobden Club.)

Glazebrook (*Sir Richard T.*). Science and Industry. The place of Cambridge in any scheme for their combination. 51 pp., 8vo. Cambridge, 1917. (University Press.)

Graunt (*John*). Natural and Political Observations mentioned in a following index and made upon the Bills of Mortality. Second edition. 79 pp., 8vo. London, 1662. (Dr. Longstaff.)

Gresswell (*D. Astley.*) Contribution to Natural History of Scarlatina derived from Observations on the London epidemic of 1887–88. 205 pp., 8vo. Oxford, 1890. (*Id.*)

Grimshaw (*Thomas W.*). Facts and Figures about Ireland. Part 1. Comprising a summary and analysis of the Principal Statistics of Ireland for the fifty years 1841–1890. Part 2. comprising Comparative Statistics of Irish Counties with tables of the Principal Statistics of the counties for each of the six decennial census years 1841–91, and a summary and analysis. lix + 24 pp , 8vo. Dublin, 1893. (*Id.*)

Gulick (*Rev. John T.*). Evolution Racial and Habitudinal. xii + 269 pp., 8vo. Washington, 1905. (*Id.*)

Hamilton (*the Right Hon. Lord George*). Parliamentary Reminiscences and Reflections, 1868 to 1885. xii + 344 pp., 8vo. London, 1917. (The Author.)

Hammond (*J. L.* and *Barbara*). The Town Labourer, 1760–1832. The New Civilisation. ix + 346 pp., 8vo. London, 1917. (Longmans, Green and Co.)

Harleys (*Messrs.*). The Development of Town House Property. Profitless Properties made Profitable. 10 pp., sm. 8vo. London, 1917. (Messrs. Harleys and Son.)

Higgs (*Henry*). National Economy. An Outline of Public Administration. xii + 147 pp., 8vo. London, 1917. (The Author.)

Hodges (*H. R.*). Economic Conditions 1815 and 1914. 91 pp., 8vo. London, 1917. (Allen and Unwin.)

Johnson (*Stanley C.*). History of Emigration from the United Kingdom to North America, 1763 to 1912. xvi + 387 pp., 8vo. London, 1913. (Dr. Longstaff.)

Keltie (*J. Scott*). The Statesman's Year-Book, 1917. xliv + 150 pp., 8vo. London, 1917. (The Editor.)

Lavergne (*Bernard*). L'Union Commerciale des Alliés après la Guerre. Hostilités douanières envers l'Austro-Allemagne. Tarifs préférentiels entre Alliés. 77 pp., 8vo. Paris, 1917. (The Author.)

Lewis (*J. Norman* and *C. J.*). Natality and Fecundity. A Contribution to National Demography. vi + 170 pp., 8vo. London, 1906. (Dr. Longstaff.)

(c) Authors, &c.—*Contd.*

MacDowall (*Alex. B.*). Weathers and Disease. A Curve History of their variations in recent years. 82 pp., 8vo. London, 1895. (Dr. Longstaff.)

Mayr (*Dr. Georg von*). Statistik und Gesellschaftslehre. Band i. Theoretische Statistik. viii + 202 pp., 8vo. Leipzig, 1895. (*Id.*)

Morton (*John A. J.*). The Industrial Counterpoise. As the foundation for Social Harmony and Universal Peace. vi + 126 pp., 8vo. London, 1917. (The Athenæum Press.)

Mulhall (*Michael G.*)—

Balance-sheet of the World for Ten Years. 1870 to 1880. Second edition. viii + 143 pp., 8vo. London, 1881. (Dr. Longstaff.)

Mulhall's Dictionary of Statistics. New edition, revised and corrected. 504 pp., 8vo. London, 1886. (*Id.*)

Murchison (*Charles*). Treatise on the Continued Fevers of Great Britain. Second edition. xix + 729 pp., 8vo London, 1873. (*Id.*)

Newsholme (*Arthur*). Epidemic Diphtheria. A research on the origin and spread of the disease from an international standpoint. Second edition. 196 pp., 8vo. London, 1900. (*Id.*)

Ramsay (*J. Grant*). One Hundred Points in Food Economy. Sm. 8vo. London, 1917. (G. Bell and Sons, Ltd.)

Ransome (*Arthur*). The Causes and Prevention of Phthisis. vi + 146 pp., 8vo. London, 1890. (Dr. Longstaff.)

Savory (*A. H.*). The Nakedness of the Land. The Agricultural Problem and its Solution. 71 pp., 8vo. Oxford, 1917. (B. H. Blackwell.)

Schonfeld (*Dr. Eduard*). Astronomische Beobachtungen auf der Sternwarte der Königlichen Rheinischen Friedrich-Wilhelms-Universität zu Bonn. Band 8. Section 4. 459 pp., 4to. Bonn, 1886. (Dr. Longstaff.)

Scott (*Benjamin*). A Statistical Vindication of the City of London, or Fallacies Exploded and Figures Explained. xi + 200 pp., 8vo. London, 1867. (*Id.*)

Scott (*William R.*). Economic Problems of Peace after War. The W. Stanley Jevons Lectures at University College, London, in 1917. xii + 122 pp., 8vo. Cambridge, 1917. (Cambridge University Press.)

Seeholzer (*Henri*). France et Suisse. Discours prononcé à Bordeaux le 9 Février 1917. 23 pp., 8vo. Zurich, 1917. (Art Institut Orell Fussli.)

Smith (*Richmond Mayo*). Emigration and Immigration. A Study in Social Science. xiv + 316 pp. London, 1890. (Dr. Longstaff.)

Spooner (*Henry J.*). Industrial Fatigue in its Relation to Maximum Output. Forewords by Sir Robert Hadfield, F.R.S., and Mr. J. R. Clynes, M.P. 59 pp., sm. 8vo. London, 1917. (Labour Co-partnership Association.)

Thorne (*R. Thorne*). Diphtheria: Its Natural History and Prevention. Being the Milroy Lectures delivered before the Royal College of Physicians of London, 1891. 266 pp., 8vo. London, 1891. (Dr. Longstaff.)

Wagner (*Hermann*) and *Supan* (*Alexander*). Bevölkerung der Erde. viii and ix. 2 vols., 8vo. Gotha, 1891–93. (*Id.*)

Whetham (*W. C. Dampier*). The War and the Nation. A Study in Constructive Politics. viii + 312 pp., 8vo. London, 1917. (J. Murray).

Whetham (*William C. D.* and *Catherine D. Whetham*). The Family and the Nation. A Study in Natural Inheritance and Social Responsibility. 233 pp., 8vo. London, 1909. (Dr. Longstaff.)

(d) Societies, Periodicals, &c. (British), and Miscellaneous.

Finance. Our Financial Policy and the Rate of Interest. A Criticism. 60 pp., 8vo. London, 1917. (P. S. King and Son, Ltd.)

Southern Slav Library. Political and Social Conditions in Slovene Lands. (Carniola, Carinthia, Illyrian, Littoral and Styria.) 36 pp., sm. 8vo. London, 1916. (The Southern Slav Library.)

ANNUAL LIST OF ADDITIONS TO THE LIBRARY.

Since the end of July, 1916, the Society has received the periodical publications enumerated below. They are arranged alphabetically by subjects (works of a general nature coming first) under the following heads:—(a) Foreign Countries; (b) India and Colonial Possessions; (c) United Kingdom and its Divisions; (d) Societies, &c. (British); (e) Periodicals, &c. (British).

(a) Foreign Countries.

Argentine Republic—

Anuario de la Direccion General de Estadistica. Año 1914. Trade Returns (quarterly) for 1916.

Cordoba (Province). Anuario, año 1914.

Tucuman (Province). Anuario, años 1913 and 1914.

Brazil—

Trade Returns for 1915-16.

Chile—

Statistical Year-book for 1914-15. Trade Returns for 1915.

China—

China Year-book for 1916. List of Lighthouses, &c., 1916. Post Office Report for 1915. Trade Returns for 1915 and 1916.

Cuba—

Bulletin of Ministry of Agriculture for 1916. Immigration Returns for 1916. Report on Sugar Industry for 1914. Trade Returns for year 1915-16. Publications of National Academy of Arts and Letters, 1916.

Denmark—

Statistical Year-book for 1916. Statistical Miscellany, 1916. Nationalokonomisk Tidsskrift. Statistiske Efterretninger, 1916-17.

Copenhagen. Annual Health Report for 1915.

Iceland. Agricultural Returns for 1914. Trade Returns for 1913.

Egypt—

Statistical Year-book for 1915. Cotton Crop Monthly Statistics for 1916-17. Financial Report on the Public Debt for the Year 1916-17. Postal Administration Report for 1916. Trade and Navigation Returns for 1916. Vital Statistics for 1916. L'Égypte Contemporaine for 1916-17.

France—

Statistical Year-book for 1914. Bulletin of General Statistics, 1916-17. Bulletin of Ministry of Agriculture, 1916. Financial Statistics dealing with direct Taxation for 1915-16. Inland Navigation Statistics for 1913. Mint Report for 1913 and 1914. Prison Statistics for 1913. Railway Statistics (Intérêt local) for 1912. Trade and Navigation Returns for 1914. Bank of France Report for 1916.

Colonies. Trade and Navigation Returns for 1914.

Paris. Journal of Statistical Society of Paris for 1916-17.

Lyons. Statistics of Silk Production in France and Abroad in 1915.

Ministère des Finances. Bulletin de Statistique et Législation comparée. Circulaire Commerciale des Métaux et Minérals de Maurice Duclos. Economiste Français. Journal des Economistes. Monde Economique Polybiblion, Parties Littéraire et Technique. Réforme Sociale. Le Rentier. Revue d'Economie Politique. Revue des Sciences Politiques.

Italy—

Statistical Year-book for 1915. Causes of Death in 1913. Movement of Population in 1914. Trade Returns for 1915 (Part 1). Banca Comerciale Italiana, Report for 1916.

(a) **Foreign Countries**—*Contd.*

Italy—*Contd.*

Florence. Statistical Year-book for 1915.

Milan. Statistical Year-book for 1915.

L'Economista. Giornale degli Economisti. Rivista Italiana di Sociologia. Riforma Sociale.

Japan—

Statistical Abstract dated 1917. Financial and Economic Annual for 1916. Causes of Death in 1913. Movement of Population in 1913.

Korea. Report on Reforms and Progress in 1914-15.

Tokio. Statistical Society Journal, 1916-17.

Netherlands—

Statistical Year-book for 1915. Statistical Year-book for the Colonies for 1914. Maandcijfers for 1916. Bankruptcy Statistics for 1914. Causes of Death in 1914. Criminal Statistics for 1914. Electoral Statistics for 1916. Financial Statistics, Municipal and Provincial, for 1914. Financial Statistics, Ways and Means of the Kingdom for 1915. Labour Statistics: Strikes and Lockouts in 1915. Trade Unions, 1916. Movement of Population in 1915. Penitentiary Statistics for 1914. Poor Relief Statistics for 1913. Public Health Returns for 1915. Savings Banks Statistics for 1913–14. Shipping Statistics for 1914. Trade Returns for 1915, Parts 1 and 2. Revue mensuelle du Bureau Central de Statistique.

Norway—

Statistical Year-book for 1916. Bank Returns for 1915. Assurance Companies Returns for 1914. Bankruptcy, &c., Statistics for 1913–1914. Education Returns for 1913. Industrial Statistics for 1914. Judicial Statistics, Criminal, for 1912. Mines and Factories Returns for 1915. Lunacy Returns for 1914. Movement of Population in 1914. Municipal Financial Returns for 1913–14. Poor Relief Returns for 1914. Postal Statistics for 1915. Prison Statistics for 1913. Public Health Report for 1914. Railway Returns for 1914–15 Savings Banks Statistics for 1915. Sea Fisheries Returns for 1914. Shipping Returns for 1914. Social Insurance (Accidents) Statistics for 1914. Telegraphs and Telephones in 1914–15. Trade Returns for 1915. Veterinary Service, and Inspection of Meat Returns for 1915. Journal du Bureau Central de Statistique.

Christiania. Statistical Year-book for 1915. Public Health Report for 1915. Monthly Bulletin of Municipal Statistics, 1916.

Panama—

Bulletin of Statistics, 1915–16.

Paraguay—

Statistical Year-book for 1915.

Peru—

Trade Returns for 1915.

Portugal—

Financial Statistics, Taxation, &c., 1914. Movement of Population, 1908–13. Trade and Navigation Returns for 1914. Trade Returns (monthly), 1915. Water consumption in Lisbon and Oporto, 1914.

Lisbon and *Oporto.* Monthly Bulletins of Vital Statistics for 1915–16.

Russia—

Year-book of Department of Agriculture for 1915–16. Trade Returns for 1914 and for 1915. Vol. i.

Moscow. Statistical Bulletins, 1916.

Finland. Statistical Year-book for 1915.

Banking Returns for 1915. Electoral Statistics for 1913. Emigration Returns for 1915. Movement of Population in 1911 and 1912. Navigation and Shipping in 1912. Poor Relief in 1912. Savings Banks in 1914. Shipping Statistics for 1913. Trade in 1913.

(a) **Foreign Countries**—*Contd.*

Spain—

Trade Returns for 1915, Part I. Customs and Taxation Returns for 1916. Movement of Population in 1910 and 1911 and 1912. Statistical Year-book for 1915. Emigration Statistics for 1915.

Barcelona Bulletin of "Museu Social," 1916–17. Report of Labour Exchange for 1916.

Madrid. Abstracts of Vital Statistics for 1916–17.

Revista Nacional de Economia, 1916.

Sweden—

Statistical Year-book dated 1917. Annual Statistics for 1915–16 dealing with:—Agriculture, Assurance Companies (Life and Fire), Banks, Education, Elections, Emigration, Excise, Factory Inspection, Finance (State and Local), Fire Insurance, Fisheries, Forests, Health of Army and Navy, Industries, Justice, Labour Strikes, Land Surveys, Lunacy, Mines, Movement of Population, Pilotage, &c., Poor Relief, Postal, Prisons, Provident Institutions, Public Health, Public Works, Railways, Savings Banks, Social Insurance, Telephone and Telegraphs, Trade and Navigation, and Vital Statistics. The "Statistisk Tidskrift" for 1915–16. The publications of the series "Bidrag till Sveriges Officiella Statistik." The "Ekonomisk Tidskrift."

Stockholm. Statistical Year-books for 1913 and 1914.

Switzerland—

Statistical Year-book for 1916. Alcohol: Statistics of the *Régie des Alcools* for 1915. Assurance Companies, Reports on, for 1914. Trade Returns for 1915. Report on Commerce and Industry of Switzerland in 1915. Movement of Population in 1913–15.

Berne (Canton). Agricultural Statistics for 1914–15.

United States—

Statistical Abstract for 1916. Agricultural Year-book of U.S. Department of Agriculture for 1914 and 1915. Bulletins and Circulars of the Department of Agriculture for 1916. Bureau of Foreign and Domestic Commerce: Tariff Series Bulletins, 1916. Census Bureau: Mortality Statistics for 1914. Education, Report of Commissioner for 1915-16. Vols. I. and II. Finance: Report of Comptroller of Currency for 1916. Monthly Financial Statements, 1915-16. Immigration, Report of Commissioner General for Year 1915–16. Internal Revenue Report for 1915–16. Inter-state Commerce Commission Reports for 1915–16. Part 1. Labour Bureau: Report and Bulletins, and Monthly Review for 1915-16. Library of Congress, Report on, for 1915–16. Mineral Resources in 1914. Mint, Report of Director for 1915–16. Navigation, Annual Report of Commissioner of, for 1915–16. Railway Statistics for 1912–13 and 1913–14. Trade Returns for 1914–15.

California. Agricultural Report for 1915. Labour Statistics for 1913–14. University Chronicle.

Chicago. Board of Trade Report for 1916. John Crerar Library Report for 1916.

Connecticut. Vital Statistics for 1914.

Iowa. Labor Report for 1914–16.

Maryland. Health Report for 1913.

Massachusetts. Conciliation and Arbitration Report for 1915. Health Reports. Labour Statistics (annual and quarterly) for 1915-16. Manufactures, Statistics of, for 1914 and 1915.

New York City. Carnegie Foundation Annual Reports, 1916. Department of Health Reports, 1916. Public Library.

New York (*State*). Reports and Statistics of Department of Labour for 1915–16. Department of Health Reports, 1916.

Philadelphia. Museums Reports for 1914.

(a) Foreign Countries—*Contd.*

United States—*Contd.*

American Journal of Sociology. Commercial America. Bankers' Magazine. Bradstreet's. Commercial and Financial Chronicle, with Supplements. Duns' Review. Journal of Political Economy. Political Science Quarterly. Quarterly Journal of Economics. Yale Review. American Academy of Political and Social Science, Annals. American Economic Review. American Statistical Association, Quarterly Publications. American Philosophical Society, Proceedings and Transactions. Smithsonian Institution Publications. Casualty, Actuarial and Statistical Society. Proceedings, 1915. Harvard University Official Register, 1915–16.

Uruguay—

Statistical Year-book for years 1913 and 1914. Movement of Population in 1915.

Montevideo. Shipping Statistics for 1916.

International—

International Agricultural Institute, Publications, 1916–17. International Labour Office, Bulletins, 1915–16.

(b) India and Colonial Possessions.

India, British—

Statistical Abstract for 1913–14. Agricultural Statistics for 1914–15, Vol. 1, and for 1915 16 (Summary Tables). Coal Production and Consumption, 1917. Cotton Spinning Monthly Returns. Currency Department: Report on its Operations for 1915–16. Mineral Statistics for 1915. Moral and Material Progress in 1915–16. Prices and Wages for 1917. Tea Production in 1914. Indian Trade Journal, Weekly Issues. Trade and Navigation (Inland and Foreign) Returns for 1913–14. Trade (Seaborne), Annual Statement for 1914–15 and 1915–16, Vol. 1. Trade. Review of Trade for 1915–16. Trade, Tables relating to, for 1914–15.

Assam. Administration Report for 1915–16.

Bengal. Trade Returns for 1915–16 and 1916–17. Administration Report for 1914-15 and 1915–16.

Bombay. Paper Currency Department. Report for 1915–16.

Punjab. Public Health Report for 1915.

East India Railway. Reports, 1916–17. Indian Engineering. Wealth of India. Bengal Economic Journal. Indian Journal of Economics.

Australia, Commonwealth of—

Official Year-book of the Commonwealth, No. 9, 1901–15. Monthly Summary of Australian Statistics, 1915–16. Parliamentary Debates, Session, 1916–17. Bulletins dealing with Education, Finance, Labour, Production, Population and Vital Statistics, Social Statistics and Transport. Trade and Navigation Returns for 1914–15.

New South Wales. Official Year-book for 1915. Statistical Register for 1914-15 and 1915–16. Agricultural Gazette, 1915. Financial Statement, 1915–16. Friendly Societies Reports for 1915. Industrial Gazette for October and November, 1916. Mines Department, Report for 1915. Prisons Report for 1914 and 1915. Public Works Report for 1914–15 and 1915-16. Railways and Tramways, Report on, for 1915–16. Vital Statistics for 1915.

Queensland. Statistics of Queensland for 1915. A.B.C. of Queensland Statistics for 1915. Agricultural Statistics for 1915. Vital Statistics for 1915.

South Australia. Statistical Register for 1915-16. Agricultural Statistics for 1915–16. Public Library and Museum, &c., Report for 1915–16. Manufactories, &c., Returns of, for 1915. School of Mines, Report. Vital Statistics for 1915.

Sydney. Vital Statistics for 1915.

Tasmania. General Statistics of the State for 1914–15. Railway Returns for 1914–15. Statesman's Pocket Year-book for 1916.

(b) **India and Colonial Possessions**—*Contd.*

Australia, Commonwealth of—*Contd.*

Victoria. Victorian Year-book for 1915–16. Statistical Register for 1913 and 1914. Friendly Societies Report for 1915. Public Library and Museum, &c., Report for 1915.

Western Australia. Statistical Register for 1914–15. Agricultural Returns for 1913–14. Friendly Societies, Returns for 1915–16. Industrial Conciliation and Arbitration Proceedings in 1912–13. Mines Report for 1915.

Canada, Dominion of—

Canada Year-book for 1915. Agriculture, Department of, Statistical Publications, 1915–16. Auditor-General's Report for 1915–16. Banks, Unclaimed Balances, 1914, and Monthly Reports on Chartered Banks. Census and Statistics Monthly for 1916, and Vols. 3 and 4, 1910–11. Customs, Report of Department of, for 1915–16. Civil Service List for 1916. House of Commons Debates, 1916. Inland Revenue Returns for 1914–15. Interior, Department of, Reports for 1914-15-16. Justice, Report of Minister of, for 1913–14. Labour Statistics for 1915. List of Shareholders in Banks, 1915. Loan and Trust Companies, 1915. Militia, Report on, for 1915–16. Penitentiaries, Report on, for 1914–15. Public Accounts and Financial Returns for 1914–15. Public Works, Report on, for 1915–16. Railway and Canal Statistics for 1913–14. Trade Returns for 1914–15. Wholesale Prices, Report for 1915.

Alberta. Agricultural Report for 1914.

British Columbia. Mineral Statistics for 1915.

Manitoba. Journals, &c., of Legislative Assembly, 1916. Statutes of Manitoba, 1916.

Ontario. Agricultural Department Publications, 1915. Feeble-minded in Ontario, 1914–15. Bureau of Industries, Annual Report for 1915.

Quebec Province. Statistical Year-book, 1916.

Saskatchewan. Report of Department of Agriculture for 1914. Public Service Monthly.

Royal Society of Canada, Transactions, 1916–17.

Royal Bank of Canada, Report for 1916.

Ceylon—

Administrative Reports for 1915. Blue Book for 1915. Sessional Papers, Session 1913–15. Vital Statistics for 1915.

Jamaica—

Vital Statistics for 1915–16.

Mauritius—

Blue Book for 1915.

New Zealand—

Official Year-book for 1916. Statistics of the Dominion for 1915. Friendly Societies Report for 1915. Pensions Department Report for 1914–15. Labour Reports for 1915–16. *Wellington* Harbour Board Accounts, and Year-book, for 1915–16. New Zealand Institute, Proceedings for 1915.

Nigeria—

Lagos Customs and Trade Journal, 1916-17.

Rhodesia—

Rhodesia Chamber of Mines, Annual Reports for 1915 and 1916. Monthly Returns for 1916–17.

Straits Settlements—

Federated Malay States Government Gazette, 1916–17. Manual of Statistics, 1916.

Trinidad—

Vital Statistics for 1914–15.

Uganda Protectorate—

Blue Book for 1915–16. Railway Report for 1915–16.

(b) India and Colonial Possessions—*Contd.*

Union of South Africa—

Statistical Year-book for 1914–15. Agricultural Journal and Reports. Mines, Reports of Department of, for 1915. Trade and Navigation Returns for 1916.

Cape of Good Hope (*Province*). Ordinances, 1916.

Natal (*Province*). Fisheries Report for 1915.

Transvaal. Chamber of Mines, Report for 1915, and Monthly Returns for 1916-17.

Johannesburg. Chamber of Commerce Commercial Year-book, 1917, and Monthly Reports for 1915–16.

(c) United Kingdom and its several Divisions.

United Kingdom—

Statistical Abstracts for the British Empire, the United Kingdom, the Colonies, and for Foreign Countries for 1914–15. Annual or other Reports or Returns dealing, among other subjects, with the Army, Assurance Companies, Bankruptcy, Building Societies, Coal Tables, Colonial Tables, Colonial and Foreign Import Duties, Companies, Customs and Excise, Emigration, Factories and Workshops, Finance, Friendly Societies, Inland Revenue, Labour, Licensing, Lunacy, Merchant Shipping, Mines and Quarries, Mint, National Insurance, Police, Post Office, Prisons, Railways, Railway Accidents, Savings Banks, Trade and Navigation, Traffic, Woods and Forests, Wrecks.

Great Britain—

The publications of the Board of Agriculture and Fisheries, and of the Board of Agriculture for Scotland.

England and Wales—

Annual and other Reports dealing, among other subjects, with Births, Deaths and Marriages, Charities, Ecclesiastical Commission, Education, Justice, Local Government Board, Local Taxation, Pauperism, Police.

London County Council. Annual Report of the Council for 1914. London Statistics for 1914–15. Statistical Abstract for 1914. Report of Medical Officer of Health for 1916.

Metropolitan Asylums Board. Report for 1916.

Metropolitan Water Board. Report for 1915–16.

Acton. Accounts for 1915–16.

Islington. Accounts for 1915–16.

Paddington. Report of Medical Officer for 1914.

Poplar. Report of Medical Officer for 1916.

Wandsworth. Report of Council for 1913.

Municipal Accounts for 1915-16 of Birmingham, Folkestone, Hull, Ipswich, Leicester, Manchester and Nottingham.

Reports of Medical Officers of Health for 1915-16 of Birkenhead, Birmingham, Bristol, Chester County, Derby, Halifax, Liverpool, Manchester, Newport, Norwich, Preston, Salford, Wigan and Wolverhampton.

Calendars for 1915-16 of the Universities of Birmingham, Bristol, Durham, Leeds, Liverpool, London, Manchester, Sheffield, University Colleges of Wales and South Wales.

Mersey Docks and Harbour Board Report for 1915–16.

Ireland—

Publications of Department of Agriculture and Technical Instruction, and, among others, those relating to Births, Deaths and Marriages, Education, Emigration, Justice, Fisheries, Local Government and Taxation, Lunacy, Public Works and Reformatories.

Calendars for 1915–16 of Universities of Belfast and Dublin.

Scotland—

Annual and other Reports or Returns dealing, among other subjects, with Agriculture, Births, &c., Education, Justice, Local Government and Taxation, Lunacy and Prisons.

(c) United Kingdom and its several Divisions—*Contd.*

Scotland—*Contd.*

Edinburgh. Municipal Accounts for 1916.

Reports of Medical Officers of Health for 1914–15 of Edinburgh, Aberdeen and Glasgow.

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(d) Societies, &c. (British).

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NOTICE.

The Council have again decided to omit from the July *Journal* the usual Appendix containing the List of Fellows, Bye-Laws and Rules of the Society and the List of Donors to the Library.

For the information of Fellows and others concerned, a list is appended of the names of Fellows elected since July last year:—

List of Fellows elected since July, 1916.

Birkett, Matthew S.
Brand, Hon. Robert Henry, C.M.G.
Cope, Ralph.
Coutts, C. R. V., F.I.A.
Davies, Joseph.
Eastwood, Hon. B.
Harman, Martin Coles.
Hastings, Hugh.
Heyking, Baron Alphonse.
Isserlis, Leon, B.A., D.Sc.
Jackson, Rt. Hon. F. Huth.
Jathar, Ganesh B.
Mackay, John.
Marks, Geoffrey, F.I.A.
Marquis, F. James.
Michell, Humfrey.
Mitra, Jagesh C.
Polwarth, J. Bruce.
Pringle, Rev. J. C., M.A.
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Reeves, Hugh.
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